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ORIGINAL ARTICLES

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PREVENTION AND TREATMENT OF DELAYED AND FAULTY UNION OF FRACTURES

BY CAPTAIN WILLIAM ARTHUR CLARK
Medical Reserve Corps, U. S. Army

(With ten illustrations)

THE literature on fractures is already so voluminous that one hesitates to add to it, but the very fact that writings are so numerous is evidence of the complexity of the subject and the need of standardization of treatment.

Were it possible to treat all fractures under ideal conditions from the beginning, nothing would need to be said on the subject of delayed union and malunion, for such results would not be found. Prophylaxis here is the best form of treatment. However, all surgeons will have bad results in fractures, avoidable or unavoidable—a sequence of non-coöperation on the part of the patient, of the surgeon's own remission of care to the minutest detail of treatment, or of his inexperience or lack of comprehension of mechanical principles involved and the importance of their proper application.

It is intended in this paper to emphasize the importance of prevention and only the principles of treatment will be outlined. The observations contained herein are based partly on five months' service in the Belgian Red Cross Hospital at La Panne. It was noted that the problem is the same in principle, whether encountered in military or in civil practice, but that the details differ on account of the more extensive wounds and greater frequency of infection in the military experience. Most of the illustrations are Civil War specimens, from the Army Medical Museum, D. C.

We shall soon be receiving into our hospitals, at home and abroad, vast numbers of these cases, and it is fitting that we should endeavor to improve our technique and knowledge of their treatment in every way possible, in order that we may restore to normal

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function a leg or arm deformed in union or with a false joint. Jones has said that there is no such thing as non-union, aside from syphilitic disease, but that there is frequently delayed union. Every surgeon with wide experience in bone work has noticed that fractures do not heal firmly in the classical three, four, or six weeks set down in text-books for the various bones.

A simple fracture of the femur which is ready for weight-bearing in six weeks, is, as we all know, the exception rather than the rule. A fractured tibia is rarely ready for use in five weeks or a fractured humerus in four weeks. Where these text-books figures came from, we shall not concern ourselves to find out, but we shall take conditions as we find them. The time lost from the firing line by the non-effectives is the important item for consideration. For the compound shattered fractures, we shall, of course, have to rely on our individual and collective experience of the past three years of war surgery in determining averages for each bone. As the severity varies so enormously, we have as yet no definite idea of these averages. For simple fractures we have our longer experience of civil practice as a guide. Averages in time lost from work after simple fractures, compiled by the Committee on Fractures of the American Association, quoted by Stimson, are as follows:

Shaft of humerus	14	weeks
Head and neck of humerus	11.5	weeks
Humerus at condyle	9.0	weeks
Both bones of fore-arm	10.8	weeks
Femur, all sites	7.37	months
Leg	4.75	months

A smaller number of cases compiled by Freeman,[1] from cases arising in a mining practice, gives the following averages in time lost:

9 cases	Femur, simple	7.8	months
21 cases	Both bones, leg, simple	99.3	days
10 cases	Tibia, simple	65	days
17 cases	Fibula, simple	54	days
39 cases	Phalanges, simple	18.5	days
17 cases	Both bones, leg, compound	155	days

With these averages for simple fractures in mind, we can form some idea of the average time lost on account of compound shattered fractures at each of these sites, and of the total time of non-effectives.

[1] *Annals of Surgery*, 1917, Vol. lxvi, p. 198.

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We can also appreciate more fully the necessity of the utmost care in treatment to preclude delays and reverses in the course of repair of every fracture coming into our hands.

There is no other type of wound which requires a longer time to repair before the soldier can be returned as a fighting man, and few others more liable to render him permanently noneffective.

In addition to the classical causes of delayed union, such as syphilis, scurvy, mal-position, interposition of soft parts, infection and interference with circulation, we have to consider the loss of substance, either from primary trauma by shell fragments or from operative procedures, the necrosis of poorly nourished fragments, and the destruction of nerve supply.

As to primary trauma, it is very uncommon, if not impossible, to have a complete hiatus between the fracture fragments as a result of shell fragment or bullet. The soft parts prevent total loss of the shattered bone and, unless the wound is of amputating proportions, the splinters of bone will be left more or less scattered between the sound fragments. It is, then, only by operative procedures that a total absence of bony tissue between fragments will result. The total removal of fragments is sometimes necessary to control infection, but the practice as a primary operation in shattered fractures is to be condemned. Up to a point short of the limit where amputation on account of infection would be indicated, time should be allowed before radical removal of all fragments. This would give the best chance of a union without secondary operation. This judicious conservation of bony tissue is one of the important factors in prevention of long delayed union. To avoid their loss, Jones advises the replacement of loose fragments after they have been taken out and washed. Fragments having periosteal and muscular attachments should not, under any consideration, be removed. Given, then, a shattered fracture upon which operative interference has been at the minimum consistent with conservation of life and limb, the delayed and faulty union problem is simplified from the start.

Another operative procedure which, in the hands of 95 per cent of all surgeons, results in delayed union is the introduction of plates, screws, wires and various other foreign matter into a fracture wound. Without entering into a discussion of this much debated subject, it may be stated that it is the general experience of surgeons, at least of American surgeons, that the introduction of such material practically always delays union and many times defeats the purpose altogether. The acceptance by most surgeons of the

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autogenous bone graft or splint is now a good reason for discouraging the use of foreign material.

Of prime importance, also, to prevent malunion (not non-union) is adequate immobilization. A fractured bone will unite in spite of motion, constitutional state being propitious, but the union will most likely be bad, either angulated or in abnormal rotation. This we can see for ourselves in museum specimens of animals and semi-civilized men, showing results in untreated fractures. (See Figs. 1, 2 and 3.) Our main object, then, in immobilization is to secure a *good* union, so it will readily be appreciated that the position in which immobilization is maintained is more important than the immobilization itself. A femur put up with the upper fragment allowed to continue in the anterior displacement into which it is always pulled by the anterior thigh muscles, or with the lower fragment rotated outward, might as well be left without any apparatus at all. The fixation of the joint on each side of the fracture, as set forth in classical teachings, is not always necessary. In fact, such fixation is in some cases less efficient, the patient's comfort and facility of dressings considered, than some sort of apparatus such as the suspension scheme popularized by Blake, which permits of motion of all joints, yet, by keeping the muscle pull neutralized, prevents any mal-position of the fragments. Today, one does not hesitate to treat a femur or leg fracture without rigid fixation, but one should be, nevertheless, appreciative of the necessity of attention to position of the fragments.

It may seem superfluous to call attention to the necessity of Roentgen pictures in two planes, yet cases of delayed union or of malunion come to attention, when the only thing, apparently, which could have misled the surgeon was the single antero-posterior view showing apparent good opposition of a fractured long bone, while a lateral view would have shown one fragment far behind the other with interposition of soft parts to such an extent that union could not be hoped for in less than six months, and even that a malunion. If it is impossible to take a lateral view; at least a view from an angle of 45 degrees could be had and would show such a defect.

The problem of malposition which results in malunion is purely a mechanical one, and to convert a bad position to a good one at the outset requires a mechanical knack and a knowledge of the direction of muscle pull across the joints on either side of the fracture. If we cannot all have a mechanical knack, we *can* all have this knowledge of muscle pull. When one remembers that the anterior muscles of the thigh will always pull the upper fragment of a frac-

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tured femur into a flexed position, it is easy to foresee that the Roentgen plate will show the upper fragment anterior to the lower. Since there are only three internal rotators of the thigh, and these comparatively weak ones—tensor fascia femoris, gluteus medius, and gluteus minimus—the balance of the muscle pull, when the normal fulcrum is removed by fracture, is bound to produce an external rotation. The pull of the leg flexors over the back of the knee can always be depended upon to displace the lower fragment backward in a fracture below the upper third of the femur. It is rare, then, in fracture of the shaft of the femur to find any position other than external rotation, and flexion of the proximal fragment and backward displacement of the distal fragment. The simplest example of the action of muscle pull is that of the os calcis, which could obviously be displaced no other direction than upward, granting an uninjured achilles tendon. Considering the humerus, the upper fragment will always be rotated outward by the supraspinatus, infraspinatus and teres minor muscles, and, if the line of fracture is below the deltoid insertion, will be abducted by the pull of the deltoid. In a clavicle, the proximal fragment will go upward on account of tension of the cleido-mastoid. A radius fractured above the insertion of the pronator radii teres will have its upward fragment twisted around into extreme supination by the supinator brevis, while if below the pronator insertion, the pull of the two opposing muscles will neutralize each other and displacement will not be marked in either supination or pronation. Should the fracture be below the upper margin of the pronator quadratus and involve both bones, the action of this muscle will pull the two bones together.

These well-known facts are frequently forgotten at the time of handling a fracture; a poor position is allowed to persist and a faulty or a long-delayed union follows.

In cases of open fractures, with which we have mostly to deal, we can often see the position of fragments, and, in closed ones, roentgenograms in two planes will enable us to visualize them, so that our problem is then to overcome the displacement, knowing its extent and direction. With the above facts in mind, we shall consider how to avoid the faulty or delayed union. In producing and maintaining a proper alignment, one of the two fragments must be moved into line with the other. Usually this will be the distal fragment, since that is the one more easily controlled. In some cases this fragment is so short that it cannot be handled, as, for example, a supracondylar fracture of the humerus or femur, and in this case

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one resorts to placing the joint in a position most favorable to restoration of the fragment to its place. In these two instances that position will be flexion, with one exception—a supracondylar flexion fracture of the humerus. In this special case, flexion would increase the deformity and result in a faulty union with possibly a filling up of the olecranon fossa with callus. Such a fracture must be treated in extension.

More frequently it is the upper fragment which is out of control, and in these cases, of course, the only alternative aside from open operation is to manipulate the lower fragment into line with the upper, no matter what position this may call for, and maintain it there with the proper splint. For example, should the fracture be at the surgical neck of the humerus, the upper fragment cannot be fixed in splints and, on account of the muscle pull, as mentioned above, will be in external rotation. Obviously, if such a fracture be put up with the lower fragment against the chest and rotated inward with the forearm across the breast, the union would be in abnormal position as regards rotation. Such a fracture must be treated with the lower fragment rotated outward, and this is best accomplished by placing it in abduction with the forearm raised and supported; hence the so-called aeroplane splint which should be used here. This position furnishes the maximal relaxation of all the muscles passing over the shoulder joint, thus preventing tension and consequent displacement of fragments. It is the position of election for fractures above the lower third of the humerus.

On the same principle, to preclude a faulty union of a radius fractured above the insertion of the pronator radii teres, the lower fragment must be rotated outward to bring it into line with the upper fragment which is twisted in that direction by the supinator brevis. This is accomplished by extreme supination of the arm and its fixation in that position until union is firm. Should both bones of the forearm be broken, their union one with the other is liable to occur. One precaution in preventing such a deformity is the use of flat splints wider than the arm, instead of gutter splints or plaster casts which tend to bind the bones together.

In regard to the femur there is no excuse for treatment of fracture of the shaft in extension. The thigh should always be flexed more or less at the hip, and the leg flexed at the knee to preclude faulty position, which is liable to occur from tension of the muscles. The varieties of splints for this purpose are numerous, but the best method is a modification of the Hodgens splint combined with suspension. This gives the maximum of muscle relaxation, brings the lower

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fragment into line with the already flexed upper one and, with proper application of weights, overcomes the tendency to outward rotation. It also permits dressing of the wound without disturbing the position. The problem of traction must be met to suit the condition and must be met promptly. Every hour that an overriding is allowed to persist multiplies the difficulty in overcoming it. The splint provided in the new set adopted by the fracture section, for transportation of the fractured femur cases, has provision for traction, and the surgeon should not fail to apply it the moment the case first comes under treatment. Except for early and temporary use, adhesive strips as a means of traction are unsatisfactory, even when enough surface remains for their application. The pull is applied to the skin and transmitted to the muscle through this elastic tissue, and, in a roundabout way, finally to the bone. There is so much lost motion that very little of the weight applied reaches the bone. We are speaking now, of course, of the flexed position and the resulting necessity of applying the adhesive strips to the thigh above the knee. More direct methods must be used. The Hodgen splint can be made to perform an automatic traction which increases in efficiency as the angle of flexion at the knee becomes more acute.

The posterior surface of the leg below the knee receives the pressure of the traction furnished by a weight attached to the splint, the pull being in a line at about a right angle to the shaft of the tibia. This pull is transmitted directly through the flexed knee-joint to the lower fragment of the femur, and the counterweight is the patient's body. Should this method fail or be inapplicable, one must resort to application of the pull directly to the lower fragment by means of a Steinman nail through the condyles.

Having considered some of the ways of avoiding a faulty or a delayed union, let us see what can be done with cases which have occurred from whatever cause.

At what stage shall we say that a union is delayed? If the process of repair is studied by roentgenology, one will be able to foresee a delay very early in the course of treatment. The periosteal callus should begin to cast an appreciable, though ill-defined, shadow in ten or twelve days. If at the end of three weeks no shadow can be found, one may reasonably expect a delay in union, or at least in ossification. New callus is normally completely ossified, that is, it casts a shadow as dense as that of the original bone, in about a year, but union in the clinical sense may have been consummated in one-fourth that time. A clinical examination, for example, of a frac-

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tured tibia may reveal very slight motion and may lead one to believe that union is about complete, while the roentgenogram may show that little or no ossification has taken place. This is due to the proliferation of strong fibrous tissue which holds the fragments firmly, but which, of course, casts no shadow on the plate. Such a fracture may be strong enough if apposition is good and support to prevent refracture is provided. In fact, it is often desirable that the bone should be put to use in order to furnish a physiological stimulus to ossification. Such a case is an example of Wolff's law that the structure of a bone adapts itself to the function. With the patient lying in bed, his leg in a cast for a long time, even the normal bone will become atrophied to some extent, in which condition one can scarcely expect a new callus to ossify. A delay in ossification is often due to this one fact, and as soon as the patient is allowed to walk the delay is over. If the surgeon's or patient's inclination or other causes whatsoever are against this plan, then the same principle can be applied in Bier's hyperemia or Jones' "hammer and dam" treatment. This hammering the site of the fracture with a rubber hammer furnishes a stimulus which, in a way, serves the same purpose as the physiological function, and the production of venous stasis by means of a Martin bandage provides an increased blood supply which favors repair, a condition which obtains when the leg is allowed to assume its normal position in walking. According to Stimson, delayed union is more common in the upper than lower limbs, and lack of physiological stimulus and blood supply may be the explanation. A patient will nurse along a fractured arm much longer proportionately than he will submit to being bedridden by a fractured leg.

If these means fail, one is justified in doing an open operation. Much longer time is allowed before operating if the apposition is good, in the hope that ossification will finally take place and probably be complete sooner than if the patient were subjected to the reverse of an operation. Given only a fair approximation of long standing and a delay in ossification, the introduction of a bone graft—never a metal plate—is indicated. No matter if one does favor metal plates for fresh fractures, he should never employ them in an old fracture because of the chances of a much longer delay or fatal infection. The choice of a technique will depend upon the type of fracture. If there is a loss of substance following a shell wound, infection and removal of fragments, one will use a bridging graft inserted into the medullary cavities of the fragments. If the fracture is fairly simple and transverse the cortical graft designed by Albee

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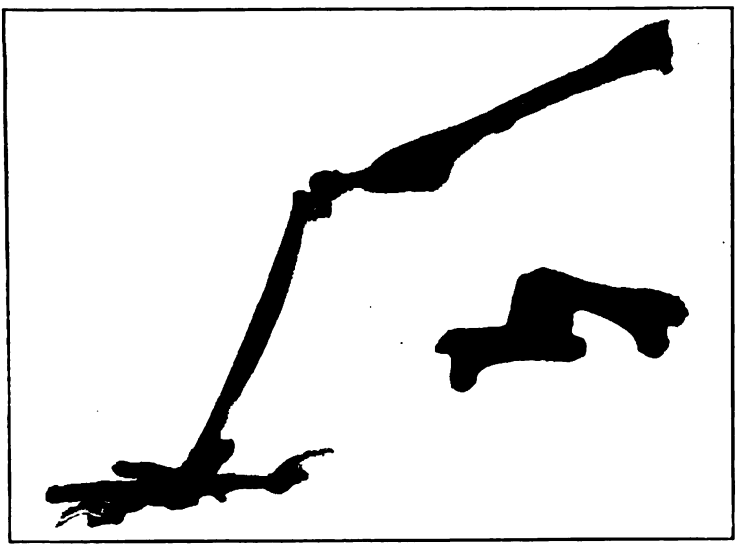

FIG. 1.—UNTREATED FRACTURES IN LEG OF CHICKEN AND OF HAWK. HEALED WITH DEFORMITY. (Army Medical Museum.)

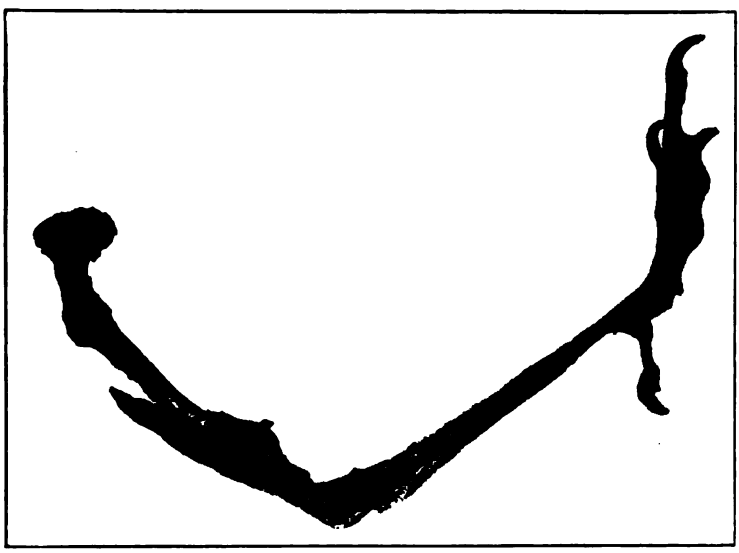

FIG. 2.—FRACTURED LEG OF WILD TURKEY. UNION WITH DEFORMITY. (Army Medical Museum.)

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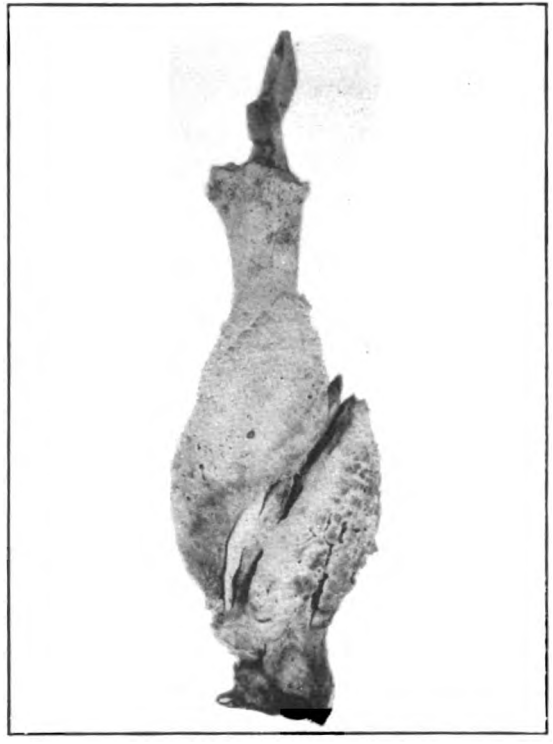

FIG. 3.—HEALING FRACTURE LEG OF DEER. EXTREME OVERRIDING. EXUBERANT COLLUS INDUCED BY FUNCTION. (Army Medical Museum.)

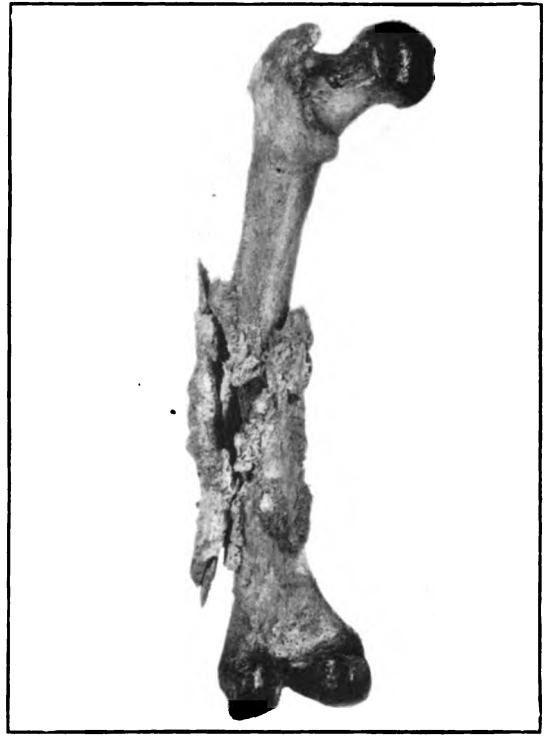

FIG. 4.—BUTTERFLY FRACTURE OF FEMUR BY RIFLE-BALL. DEATH FROM SUPPURATION ON SEVENTIETH DAY. (Army Medical Museum.)

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FIG. 5.—FAULTY UNION OF FEMUR. AMPUTATED SEVENTEEN MONTHS AFTER THE FRACTURE. (Army Medical Museum.)

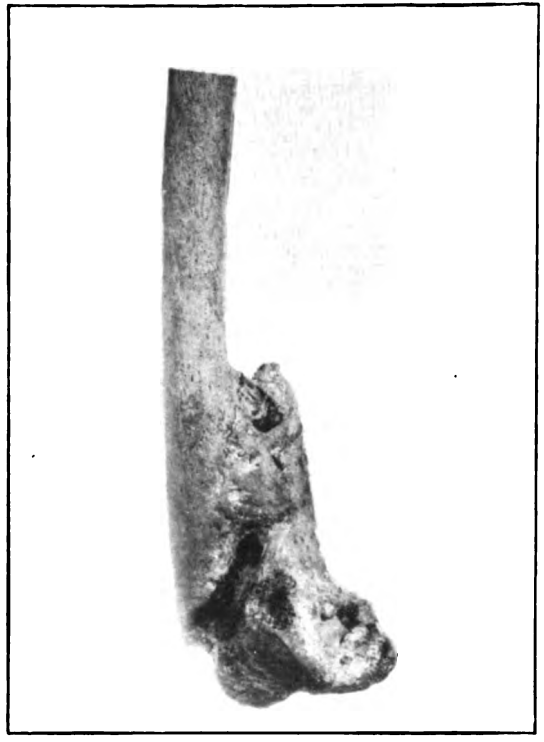

FIG. 6.—MAL-UNION SUPRACONDYLAR FRACTURE OF FEMUR. (Army Medical Museum.)

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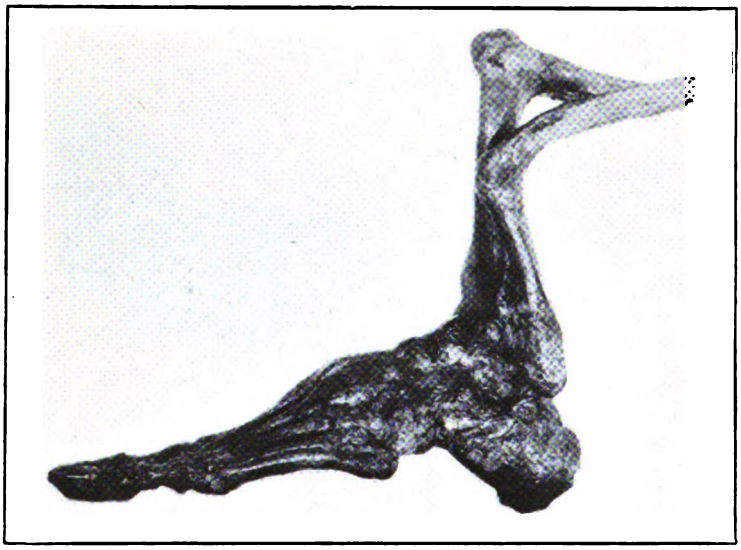

FIG. 7.—VICIOUS UNION IN FRACTURE BOTH BONES OF LEG. OCCURRED IN A BOY A YEAR OLD AND AMPUTATED WHEN NINETEEN YEARS OF AGE. (Army Medical Museum.)

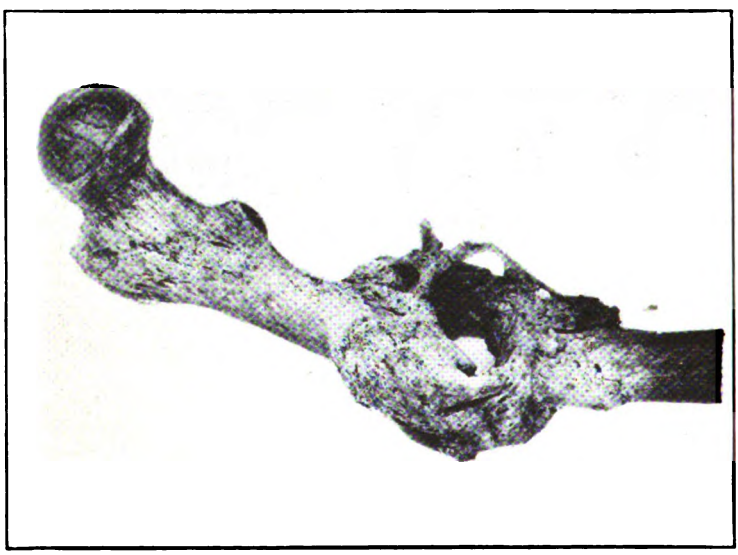

FIG. 8.—FAULTY UNION, AFTER FRACTURE OF FEMUR BY RIFLEBALL. DEATH FROM EXHAUSTION SIX MONTHS AFTER INJURY. (Army Medical Museum.)

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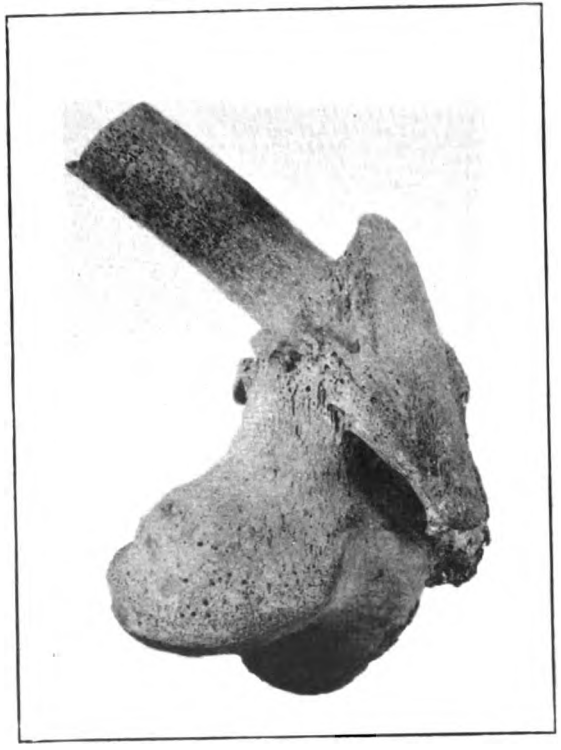

FIG. 9.—DEFORMITY AFTER SUPRACONDYLAR FRACTURE OF FEMUR. AMPUTATION AT NINE MONTHS. PATIENT RECOVERED. (Army Medical Museum.)

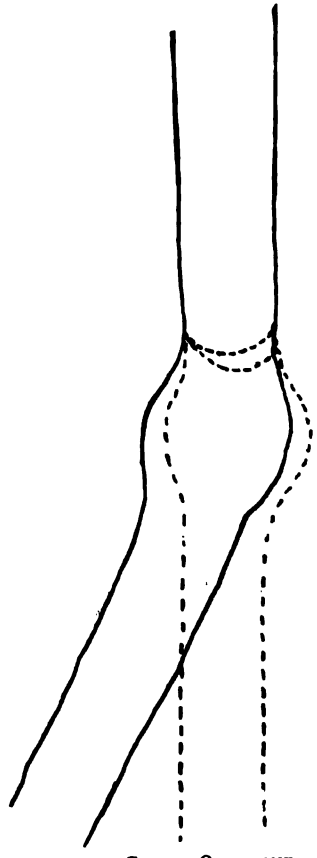

FIG. 10.—CURVED OSTEOTOMY.

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is to be preferred. Spiral fractures are best treated with medullary grafts, which should fit tight to prevent rotation of the fragments. One who has not had experience in this form of operative work cannot appreciate the difficulties that arise. Practice on the cadaver is advised before attempting the operation, in order that serious mistakes may be avoided. It is better to control hemorrhage as it arises rather than with a tourniquet, for the filling of the potential cavities with blood after removal of the tourniquet increases the chances of infection and delays the process of repair on account of the necessity of absorption of the clot. In order to eliminate every possible source of infection, the instrumental technique should be strictly adhered to; this is easier said than done, as it requires much practice. It is advisable in every possible case to take the graft from sound bone at the site of fracture, thus simplifying the operation and reducing chances of infection.

One of the greatest difficulties, however, will be encountered in obtaining an approximation of the fragments in cases of long standing with over-riding. Here the soft parts have contracted and adjusted themselves to the new shortened position, and the combined strength of muscle, fibrous tissue and perhaps a slight callus resists the attempt to lengthen the limb by stretching. Before operating, a continual traction with weights should always be tried for a week or ten days to overcome gradually this contracted condition of the soft parts. If the case has gone too long—four or five weeks—this will probably fail on account of the strong fibrous tissue next to the bone, and one must depend upon careful incision to free the fragments.

The most difficult and dangerous cases are those of overriding fragments in fracture of the femoral shaft. Dangers in this region from shock and infection are fully as great as those in abdominal operations. A pull on the femur, strong enough to overcome the tension of the soft parts and produce a lengthening of even one inch, may result in shock with fatal result, especially in patients whose resistance is decreased by many weeks in bed. The condition of the patient should be watched during manipulation of such a fractured femur as carefully as in an abdominal or a brain operation, and repair of the fracture must be sacrificed to the general good of the patient should the occasion arise.

Cases in which ossification has taken place with faulty union of the fragments will usually require an osteotomy. In simple, angular deformities one can make a curved osteotomy incision with a curved chisel (Fig. 10). The lower fragment can then be swung around

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into proper alignment, the two cut surfaces gliding over each other as in a ball-and-socket joint. This method is to be preferred to the wedge incision, as it has the advantage of holding the fragments in position more securely than a transverse or a wedge-shaped osteotomy.

Should the callus be exuberant and the deformity vicious, or should union with over-riding have occurred, the osteotomy incision should be chosen to suit the case. In many instances, of course, it will amount to no more than refracturing of the bone, and will not need to conform to any set lines. In a shortening deformity of the femur with firm union in good alignment, one might be justified in shortening the other femur a corresponding amount, rather than attempting a lengthening of the fractured one. This has been advised and done by Ducuing and Uteau[2] at Toulouse, for cases with loss of substance and union with marked shortening.

The deformity which most frequently follows a faulty union of fracture just above the ankle is a separation of the malleoli and inward displacement of the astragalus resulting in a pronated foot. After firm union, readjustment of the malleoli is impracticable on account of the proliferation of tissues between them. To overcome the bad position of the foot, it should be forcibly supinated, under anesthetic, if necessary, until the position is over-corrected, and held there in a plaster cast for two or three weeks, the time depending upon the duration of the deformity. After taking off the cast the foot must have a supinating brace to be worn for about six months, following which a supporting plate under the longitudinal arch, and a modified Thomas supinating heel on the shoe should be worn for a year longer. By that time, if the foot has been kept in supination continually, the readjustment of the intermalleolar space will probably prevent a recurrence of the pronation. Such a case should be under observation for several months after removing all apparatus and treatment begun again should the deformity begin to return. All this can be avoided in the beginning if, during the healing of the fracture, the foot be maintained in supination as described above.

Deformity at the wrist, following a Colles or other fracture at the lower end of the radius, may be corrected by a curved osteotomy. This deformity can be avoided by thoroughly breaking up the impaction in the beginning under anesthetic and adjusting the alignment of fragments. The best way to break the impaction is to apply the force in the same direction as that causing the fracture, thereby increasing the existing deformity. This is done by placing the patient's

[2] *Lyon Chir.*, 1916, Vol. xiii, p. 814.

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forearm vertically with the elbow resting firmly in a pad on a solid table, and the operator making pressure with the base of his palm against the base of the patient's hyperextended palm. In this manner one can throw a considerable amount of his own weight upon the lower fragment. Having thus loosened the fragment, the force is reversed and the patient's wrist flexed to bring the fragment into line.

The most troublesome deformities at the elbow are loss of the carrying angle and those resulting in limited flexion. The loss of the carrying angle is not so common in adults as in children, but is likely to occur in the younger of the soldiers. It is best corrected by supracondylar osteotomy of the humerus, the line of the bone chiseling being curved laterally with convexity toward the condyles. The condyles can then be readjusted so that the inner condylar surface is slightly lower than the outer. For the limited flexion, it is sometimes sufficient to fix the arm in the extreme limit of flexion so as to cause pressure on the prearticular tissues and the coronoid fossa. By redressing every four or five days, more flexion can be obtained each time as a result of absorption of some of the fibrous or callus tissue which has prevented the flexion. This failing, it will be necessary to open anterior to the joint and excise the callus or other obstructing tissue.

MEMBERS WILL PLEASE HAVE IN MIND THAT THE 27TH ANNUAL MEETING OF THE ASSOCIATION OF MILITARY SURGEONS, U. S., WILL BE HELD AT CAMP GREENLEAF, FORT OGLETHORPE (CHICKAMAUGA), GA., MONDAY, TUESDAY AND WEDNESDAY, OCTOBER 14TH, 15TH AND 16TH, 1918.

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THE EXAMINATION OF MEN OF THE FIRST DRAFT REFERRED TO THE CARDIO-VASCULAR BOARD, 89TH DIVISION, CAMP FUNSTON, KANS.[1]

By Captain JULIEN L. BENJAMIN
Medical Reserve Corps, U. S. Army

(With two illustrations)

IN THE examination of large groups of men, as has been the case very frequently in the cardio-vascular division at Camp Funston, a good working system is the most important adjunct. There is even greater need of a system with "snap" in the case of the special examination than in the general examination, because in the former instance a cog in the wheel is represented, its presence or absence at the required time rendering the momentum of motion smooth or interrupted. From time to time various systems of examinations as conducted in army cantonments have been described. It might not be amiss to say a few words concerning the system as practiced at Funston.

During the earlier months of work, upon arrival the drafted men were directed immediately to their organizations, at which places the physical examinations were conducted. Then, in the course of this hurried examination, individuals showing gross lesions were referred to the various special examiners, trusting that in the ensuing three months other pathological signs would show up in the course of drill. It so happened that with this system very few cardiac cases were reported. This number grew very rapidly later. This may be attributed to two causes: First, the soldiers, having had lesions in the beginning, sometimes even unknown to themselves, were only brought to the notice of the special examiners after the stress of drill made further examination necessary; secondly, the tuberculosis board began its examinations of the entire command during the latter part of October.

They had been instructed to refer cases showing doubtful cardiac signs to the special cardio-vascular examiner. This brought a large inrush of recruits.

The new system of examining recruits as conducted at the present time is much as follows. In the first place the men are immediately

[1] Lieutenant W. Long, of the tuberculosis board, very kindly assisted in the examination at various times. Most of the detail work of the chart as well as the more arduous duties of tabulation were accomplished by the aid of Alice K. Benjamin. It is my privilege to add my appreciation for this valuable assistance.

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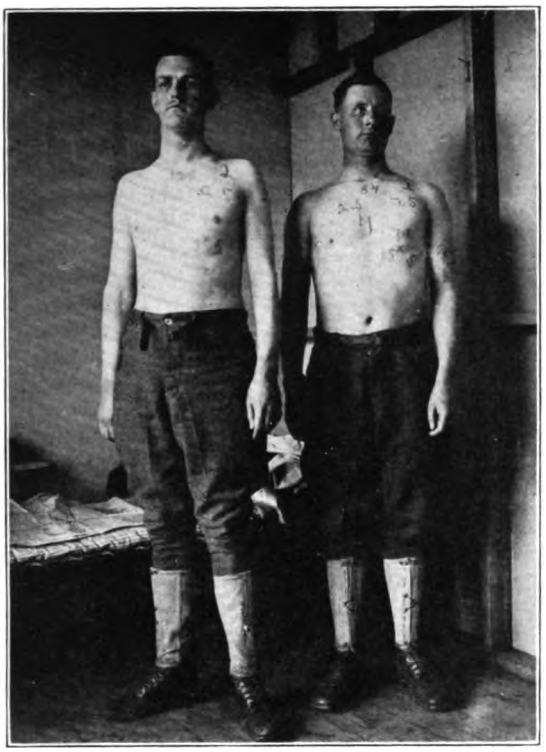

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assigned *en masse* to one depot brigade. Immediately upon arrival they are all examined in this organization, where also meet the special boards. The men are stripped of their civilian clothes, given their initial bath, and proceed immediately to undergo their first general examination, where they are also vaccinated, inoculated against typhoid, their finger-prints taken, and all examined for tuberculosis. This latter board immediately refers the cardiac cases to the special examiner. It is easily seen how much this facilitates future work, both for the commanding officers and the regimental surgeons.

In the cardiac room the system is much as follows. One examiner and one corps man are in attendance. A record is kept of each man. It has been found that six men can conveniently be examined at one time. From the photograph appended it is noted that various numbers appear on the chest. These are written by the examiner to be copied by the corps man, thus eliminating the necessity of calling off data. The interpretation of the numbers is as follows: The number at the top of the sternum represents the dorsal pulse rate. The numbers under the left shoulder is the serial number of the recruit, the figure to the right of the sternum is the measurement of the right border of the heart from mid-sternum and that to the left is the number of centimeters the left cardiac border extends from the mid-sternum. The two numbers beneath the nipple indicate the space where the apical pulsation is felt with greatest force and its location inside or outside the nipple line. After completion of this data the patient is directed to lie down, when the dorsal pulse rate and blood pressure are taken. After this he is directed to hop one hundred times on one foot (the type of hop being first demonstrated), after which the pulse rate is taken by listening with the stethoscope. The largest number of recruits examined in this way in one day was forty-five. It has been found that it required practically eight minutes to a man.

It has been found that systematic work is doubly necessary at Funston because of the geographical relation of Funston and Fort Riley. The cantonment is at Camp Funston. The base hospital is at Fort Riley. The latter is 4 miles distant from the former. It becomes the duty of the cardio-vascular examiner to look after the special cases at both places, therefore the necessity of wasting as little time as possible on unnecessary details.

Concerning the lesions found during the examinations, of special interest is the numerical relation of mitral stenosis to mitral insuffi-

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ciency. It may be seen by consulting the chart that there is very little difference in the number of these two lesions found. During the earlier months of the examination very few cases of mitral stenosis were reported. It was only after the tuberculosis board began its work that these cases started to roll in. They were referred, firstly, because of symptoms of cough, dyspnea or hemoptysis, for which they were sent for examination of their lungs because of suspected phthisis, or they were picked up in the course of the chest examination, hitherto unsuspected. It may be noted here that the members of the tuberculosis board had been previously instructed as to just what cardiac signs to look for in the course of their work. The criteria of diagnosis as explained to them were: (1) presystolic thrill, (2) snapping first sound at the apex, (3) presystolic roll at the mitral area, (4) loud pulmonic second sound. There had been some drill in the detection of these signs prior to the examination.

It was amazing, as well as gratifying, to note the large number of such cases which were reported at this time. Doubtful cases were sent back to their organizations with a note requesting that the soldier be watched for the ensuing four weeks and at the expiration of which time to be returned with a note stating how he endured regular army duties. With the exception of a very few, such individuals proved to be very undesirable soldiers. The cause, as far as was possible to determine, seemed to have been previous attacks of rheumatism.

That more cases of mitral insufficiency were not reported might be explained by the fact that such cases were detected by the local examiners and were weeded out before coming to camp.

Insufficiency of the aortic valves was relatively frequent when one considers that we were dealing with men between twenty and thirty years of age. This fact becomes more interesting with the information that, with the exception of five cases, rheumatism seemed to have been the etiological factor. Wassermann tests were made of all the subjects in this group, and in only five were positive results obtained. Curiously enough, individuals who had this lesion stood army duties peculiarly well, as in only a very few instances were the lesions found except in the routine examination, symptoms having been wholly lacking. As regards aortic stenosis, only two positive cases were found by the writer. My predecessor diagnosed six cases complicating other valve lesions. As is to be expected, the picture presented in these cases after a few weeks of drill is very pitiful.

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The tachycardia cases were very difficult to dispose of. However, it was found, after a few months of examining recruits, that it was not always so difficult to separate the essential tachycardias from the mere nervous tachycardias. It was found expedient to call those cases tachycardias, in whom the pulse rate failed to drop below 100 in the dorsal position. One examination was never deemed sufficient, and such individuals were usually returned to their organization with a note requesting a record of the pulse rate both in the erect and dorsal positions for a week, both in the morning and evening, and such information returned to the examiner at the expiration of this time. If the tachycardia persisted, the soldier was either rejected or his defect waived for special service of a sedentary type. During the past month it has been possible to find assignable causes for such cases, as they have been very frequent in post meningitic, pneumonia and measles cases. Of course, in the latter types of cases, the individuals are observed over a longer period of time.

Fifteen cases of undisputed hyperthyroidism were diagnosed. The basis of diagnosis rested on the following symptoms complex: tachycardia, tremor, exophthalmus, Von Graave's sign, either all present or in liberal grouping. Life in the cantonment seemed to have been no etiological factor here, as the disease was present in most instances during the early examinations.

The irregularities were rather conspicuous by their almost entire absence. It was rather to be expected that at least many cases showing extra systolic contractions would be found, but in all only thirty-seven cases appeared, all of these prior to the time that the men entered upon strenuous drilling. It would appear that training acts beneficially on this type of arrhythmia. That only two cases of auricular fibrillation were found might be explained by the fact that most cases showing this type of irregularity were eliminated by the local board. The one case of paroxysmal tachycardia was of the auricular type, a paroxysm occurring in this patient after every twenty or thirty normal beats.

By the aid of the X-ray the diagnosis of two cases of aneurism was confirmed. In one instance the sacculation occurred in the middle of the arch, in the other in the beginning of the descending branch of the aorta.

The term "presystolic blurring" is used to designate an impure sound occurring just before the first heart sound, at the mitral area, insufficient to typify stenosis and at the same time not comparable

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with a perfectly normal valve sound. Such cases were always retained in the service but a note of the condition made on the proper form.

It is the opinion of the writer that the close association of cardio-vascular and tuberculosis examiners is a most desirable one. There is no doubting the fact that undesirable soldiers are thus eliminated early in their training. Of course this is true justice to the men and also makes for a more efficient organization. Such facts, recently established, which enable one to make early diagnosis of mitral stenosis, have worked wonders, for it has been found that men suffering from this particular lesion are the ones who report so frequently at sick call and in whom in the past no diagnosis has been arrived at. Of special interest is the observation that practically no case of "Disordered Action on the Heart," so vividly described by members of the Research Committee of the Hampstead Hospital, England, has been found. Of course it is always to be considered that the recruits examined here are not subjected at any time to the proximity of the battle line, as is true in England or France, to say nothing of the fact that none of them has ever engaged in battle. Following up cases referred to the cardio-vascular board from time to time here reveals the fact that the soldier has either organic lesion, a functional lesion, or no cardio-vascular disease.

A medical officer, writing from "over there," in a splendidly patriotic vein, concludes his letter thus: "Tell them we are going strong, but to send us fewer Y. M. C. A. and more aeroplanes, fewer actors and more guns, soldiers. This is war, not a party. We don't need amusement; we are too tired, and our morals are all right."

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COMMUNICABLE DISEASE AT CAMP FUNSTON AND THE MEDICAL OFFICERS' TRAINING CAMP, FORT RILEY, KANSAS, OCTOBER 15TH, 1917, TO JANUARY 15TH, 1918.

By Major HAROLD E. EGGERS, M. R. C.,
With report by Major ELLIS H. KERR, M. R. C., U. S. Army

(With two illustrations)

CAMP FUNSTON and the Medical Officers' Training Camp are both situated on the Fort Riley Military Reservation, in northeastern central Kansas. Both are on the northern side of the Kaw River, the former for the greater part on the alluvial flats adjoining the river, the latter on higher ground somewhat farther removed. Camp Funston is approximately 4 miles northeast of the Medical Officers' Training Camp.

The personnel of Camp Funston consisted principally of drafted men from Kansas, Nebraska, Missouri, South Dakota, Colorado, New Mexico and Arizona. These formed the 89th Division of the National Army. Somewhat later there were added colored troops from these same states, forming part of the 92d Division. The strength of the command at Camp Funston averaged, for the period under consideration, approximately 33,000 men for the 89th Division and from 2,000 to 3,000 for the 92d Division. At the Medical Officers' Training Camp the personnel consisted of enlisted men of the Medical Department of the army and of officers of the Medical Reserve Corps sent there for training. The enlisted men, in contrast with those of Camp Funston, were mostly sent in from recruit barracks, and came from practically the entire United States; while at Camp Funston they came almost entirely directly from their homes, from the restricted district mentioned above. The medical officers in training also came directly from their homes for the most part, and were from all over the United States, though principally from the far and middle west. The strength here varied, in the period under consideration, from 2,600 to 3,700 men, approximately one-tenth that of Camp Funston.

Epidemic respiratory disease, using the term to embrace disease transmitted by the respiratory route, first made its appearance in these camps in October (October 15, 1917, to January 15, 1918, is the period covered by this report). It was noted that five days before the appearance of pneumonia in any considerable incidence, and about fifteen days before that of measles, there was a sudden fall of

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temperature, amounting to 36°. A second fall of 17° was followed after four days by another rise in pneumonia incidence; the apex of the pneumonia incidence, from November 8 to 15, was not preceded by such a temperature fall, but in general there would appear to be an increased occurrence of pneumonia following sudden falls of temperature. Aside from this, and the apparent first great incidence of measles occurring at a time following the first great temperature fall, by the incubation period of this disease, temperature appears to have little relationship to respiratory disease incidence. The precipitation record showed no traceable relationship to disease incidence. But, indirectly, atmospheric humidity undoubtedly played a part. Due to the slight degree of precipitation and from the location of Camp Funston on alluvial soil, the period covered was characterized by an exceeding abundance of dust, both at Camp Funston and the M. O. T. C., but much worse at the former site. And shortly preceding the subsidence of respiratory disease at Camp Funston there was a period of heavy dewfall, with resultant diminution of dust; at Camp Funston this natural factor was assisted by human efforts to allay the evil. The importance of dust in this connection cannot well be minimized. Practically all inmates of both camps suffered from constant respiratory irritation, with resultant congestion and lowered resistance of the respiratory mucous membranes, and the greatly increased coughing and sneezing served to disseminate any pathogenic organisms anyone might be harboring.

In both camps, more particularly at Camp Funston, other factors operated to make the inmates more susceptible than usual. Practically all had recently—in the case of Camp Funston very recently—come from civil life, and were little accustomed to that of the army. Food, clothing, habits of life—all had undergone a sudden and radical change, the exact importance of which in this connection it is difficult to estimate. In both camps, and more particularly at Funston, the clothing, both personal and bed, was at first insufficient. The report of the sanitary inspector of the 89th Division for November notes that in that month the Quartermaster Department was first in position to furnish woolen clothing to all the enlisted men. The men were not accustomed to living in large groups, and proper ventilation was at first enforced with difficulty.

When the men first arrived, and for some time afterwards, only a small part of their quarters was completed, and the result was inevitable overcrowding, together with a failure to secure that measure of segregation obtained by separate housing of various units.

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During this period, the camp contained a fluctuating civilian population of around 10,000 workmen, some of whom undoubtedly were carriers of disease. Even after the various units were assigned to separate quarters, their barracks were for a time overcrowded, owing to augmentation in the size of companies to meet the demands of the new tables of organization; and the remodelling to meet the increased needs, and to provide a minimum of 500 cubic feet of air space per man, was not completed until December. As a final, probably less important factor, many of the men were unaccustomed to physical exertion, and fatigue may have played its part in making them more susceptible to disease. That the situation at Camp Funston was such as to make an epidemic of respiratory disease probable was foreseen by the medical personnel there. Attention was called to the situation in the following telegram, sent by the division surgeon of the 89th Division on October 7.

SURGEON GENERAL, CAMP FUNSTON, KANSAS, *October 7.*
Washington, D. C.

Report received this morning constructing quartermaster shows that installation of heat will not be made inside of forty-five days, probably longer. Weather cold and windy; dust rivals China. Condition ripe for serious epidemic of pneumonia. Recommend that installation of stoves throughout entire cantonment be authorized immediately by cantonment division Quartermaster Department.

SHEPARD.

In their indorsements of the monthly sanitary report for October, the division surgeon and the commanding officer again call attention to conditions at Camp Funston—conditions over which the Medical Department at that time had no control:

EXTRACT FROM SANITARY REPORT, OCTOBER, 1917

Hdq. 89th Division, Office of Division Surgeon, Camp Funston, Kansas, November 7, 1917.

To: The Commanding General, 89th Division.

1. * * * * * *

2. The condition of the health in this camp is not entirely as could be desired.

3. This is directly traceable to the most adverse conditions existing during the reception of the men of the National Army and the early formative period.

4. During the greater part of September and all of October the weather was unusually cold with alternating cold rains and periods of high winds, which quickly raised the dust, so that the entire atmosphere was filled with it. In addition to this there was no heat in the buildings and there was inadequate clothing and insufficient bedding.

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As the camp was not completed, there was, of necessity, crowding of men, which condition is just now being relieved.

5. As a consequence of the above enumerated adversities, the men became afflicted with colds and the mucous membrances of the entire respiratory tract were irritated.

6. This rendered the command highly susceptible to the different crowd diseases, such as pneumonia, epidemic cerebrospinal meningitis, measles, mumps, etc., all transferred through the respiratory passages, which transmission is greatly aided by overcrowding.

7. This condition was anticipated by the surgeon, as is shown by copies of telegrams forwarded to the surgeon general and of an indorsement of this office on report regarding the heating of the camp.

8. Every known method has been adopted to prevent the spread of these diseases and it is believed that with the installation of the heating, spreading out of command into the completed camp, reduction of the dust and issuance of sufficient clothing, the health of the command will undoubtedly improve.

J. L. SHEPARD,
Lieut. Col., Medical Corps.

3 incl.

SANITARY REPORT

Hdq. 89th Division, Camp Funston, Kans., November 13, 1917.
To the Adjutant General of the Army, Washington, D. C.

1. I beg to invite attention to the within report and to the comments of the division surgeon, which are concurred in.

2. First, the selection of this camp site indicated a failure on the part of those selecting it to appreciate the disadvantage of the situation from a sanitary standpoint. The camp is situated on an adobe plain only a few feet above the river which winds about it. The soil is fine adobe, forming a soft mud several feet deep when it rains, and during the dry weather it grinds up into fine, almost impalpable dust, which penetrates rooms, lockers and fills the air like a heavy fog, causing not only grave bronchial and nose irritation but also serving as a disease carrier. Failure to construct roads and a drainage system prior to undertaking work on the camp proper has caused great delay and loss of time, and, consequently, of money, and necessitated the existence of avoidable conditions which have been highly prejudicial to health. I refer to conditions of mud and dust. It has also greatly lengthened the period of the stay of civil employes in camp and, consequently, the injection of disease carriers. Medical supervision over this class of men is difficult and has been unsatisfactory as labor is scarce and realizes that we are dependent upon it. The delay in the installation of heat and the shortage of clothing and bedding at the time of reception of the men were fruitful in lowering the vitality and thereby rendering the entire command more susceptible to disase.

3. The Medical Department, under the direction of the division

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surgeon, has taken most energetic measures. The division commander has bought clothing and bedding without awaiting the arrival of supplies furnished by the department. Stoves have been put in the buildings as rapidly as possible and, here again, the work has dragged.

4. It is not believed that there is anything in the present situation to cause alarm, but it should be clearly understood that the location of the camp is such that a high average of health can only be maintained by the exercise of constant and unremitting vigilance and large expenditures with a view of insuring proper drainage. In other words, the situation in camp is such that every known means should be available to protect the health of the men.

5. Cerebrospinal meningitis is present. The cases do not come from any particular organization but have been received from all portions of the camp. The same is true of pneumonia and measles. It is of course known to the department, and was known, I presume, at the time the camp was established, that spinal meningitis was epidemic in Kansas and Missouri from 1904 to 1910 and for some three months before the estabishment of the camp reports were received that meningitis was still found in this locality. Undoubtedly the attenuated organism was carried by thousands of young men of military age who were sent here. The conditions in camp, the lack of clothing, heat and bedding, the great soil humidity for days following a rain, and the heavy dust in dry weather all tend to bring about conditions of nasal and bronchial irritation, accompanied by a lowering of vitality—in other words, just the conditions which would tend to develop the meningitis organism and plant it upon a fertile soil. All the cases that have developed so far have been from men coming from Missouri and Kansas areas, the areas in which this disease was formerly epidemic and the area in which many cases have been found from time to time during the past seven years.

6. The entire camp is under the most rigid sanitary supervision and a large number of medical officers are engaged in locating suspects, who are immediately isolated.

LEONARD WOOD,
Major General, U. S. Army, Commanding.

The maximum incidence for pneumonia and meningitis was reached in November, for measles not until considerably later. The two former diseases show at Camp Funston a striking similarity as regards incidence, and were it not for differences shown at the M. O. T. C. at Fort Riley, it might be concluded that the same factors were entirely responsible with both. Coinciding with the period of subsidence of these two diseases at Camp Funston, there were the subsidence of dust as already noted, improvement in clothing, adequate enforcement of proper ventilation, proper warming of barracks, and greater adaptation on the part of the men to their new

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life. With measles, the case is different. The maximum was not reached until December, and its subsidence did not occur until the end of that month, with another smaller exacerbation in January two weeks after the latter part of the December apex.

Pneumonia.—Types of infection: The following table is compiled from data obtained at the Fort Riley Base Hospital, and applies to cases both from Camp Funston and the M. O. T. C.:

LOBAR PNEUMONIA

Cases from which positive sputum findings were obtained	53
Cases showing pneumococcus, Type I	8
Cases showing pneumococcus, Type II	7
Cases showing pneumococcus, Type III	1
Cases showing pneumococcus, Type IV	27
Cases showing pneumococcus, Type IV and streptococcus	1
Cases showing pneumococcus, Type IV and B influenzae	1
Cases showing streptococcus alone	7
Cases showing B influenzae alone	1

PNEUMONIA AFTER MEASLES

Cases from which positive findings were obtained	26
Cases showing pneumococcus, Type III	1
Cases showing pneumococcus, Type IV	11
Cases showing pneumococcus, Type IV, and streptococcus	2
Cases showing pneumococcus, Type IV, B influenzae	4
Cases showing streptococcus alone	8

That these results are strikingly different from those obtained at the Rockefeller Institute is shown by the following comparison:

Type	*Fort Riley*	*Rockefeller Institute*
I	15%	33%
II	13%	31%
III	2%	12%
IV	50%	24%

A further series from the Base Hospital, of unclassified cases, follows:

Cases from which positive sputum findings were obtained	146
Cases showing pneumococcus, Type I	1

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Cases showing pneumococcus, Type II	4
Cases showing pneumococcus, Type III	1
Cases showing pneumococcus, Type IV	46
Cases showing pneumococcus, Type IV, and B influenzae	1
Cases showing hemolytic streptococci	33
Cases showing non-hemolytic streptococci	41
Cases showing B influenzae	2
Cases showing staphylococci	9
Cases showing staphylococci and streptococci	8

Of these, a considerable number were measles pneumonias, accounting for the large proportion of non-pneumococcus infections; but of those due to pneumococcus, the predominance of Type IV is again striking. It will be noted that this type constituted at Fort Riley a much higher proportion of infections than in the cases compiled by the Rockefeller Institute. Inasmuch as Type IV is a heterogeneous group, containing apparently organisms of the sorts found with frequency in normal throats, it would suggest that the infection at Fort Riley was largely autogenous and due principally to lowered resistance in the individual rather than to the reception of contagion from another. In this connection, while it cannot be denied that factors favorable for the transmission of infection from one individual to another were present in large degree, as is evidenced indirectly by the accompanying incidence of measles and meningitis, yet the factors of the other sort, favoring inception of disease by temporarily lowered resistance, were also present; and in the case of pneumonia were apparently predominant.

Comment has already been made of the fact that the apex of the pneumonia incidence at Camp Funston was not preceded by a temperature fall, as was usually the case. This apex was due almost entirely to excessive occurrence of the disease in one organization, the 355th Infantry. Efforts to ascertain the principal factors in this outbreak were unsuccessful, owing to the fact that the regimental personnel, both line and medical, had been changed quite largely in the interim. A plausible explanation would be that here we have a case where contagion from one individual to another played the important part, but the fact that the cases were widely disseminated throughout the several companies of the regiment, which were housed in separate barracks, makes this less probable. Not a sufficient proportion of the cases were cultured to clear up this point from the laboratory data. Such statistics as are available do not bear out the suggested explanation.

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10/24, 1917, Type IV.....1
10/29, 1917, Type IV.....1
10/31, 1917, Type II.....1
Type IV.....1
11/1, 1917, Type I.....1
II.....1
IV.....2
11/2, 1917, Type IV.....1
11/3, 1917, Type IV.....2
11/8, 1917, Type IV.....1
11/9, 1917, Type IV.....1
11/13, 1917, Type IV.....1

In the period under consideration, there were at the M. O. T. C. 28 cases sent to the base hospital with a diagnosis of pneumonia, as compared with 191 cases from Camp Funston, or 0.9 and 0.58 per cent respectively. The same general factors already enumerated would be operative at both camps.

As regards mortality, the figures obtained from the base hospital again apply to cases from both camps; they apply to completed cases.

LOBAR PNEUMONIA

	Total	*Recovered*	*Dead*	*Per cent deaths*
October 18—November 30.....	53	30	23	43
December 1-31	65	54	11	17
January 1-31	76	56	20	26.3

RELATIONS OF TYPE TO MORTALITY

Type	*Total*	*Recovered*	*Dead*	*Per cent deaths*
I	6	4	2	33.3
II	4	3	1	25
III	1	1	..	..
IV	19	9	10	52
Streptococci	2	..	2	100
B. influenzae	1	..	1	100

Measles.—On the whole, the type of measles present at both camps was mild clinically, although there were not wanting very severe cases—at least one indeed, of fatal hemorrhagic type. In spite of the mildness of the infection, there was a considerable incidence of pneumonia as a sequel.

The curve for measles shows some striking characteristics. Disregarding a first, minor rise in cases, which reached its apex on October 26, the first great incidence occurred on November 6, following the period of lowered temperature on October 19 to November 2 by a period almost exactly coinciding with the incubation period of measles. The influence of temperature in this connection is of course indirect, but the relationship is too striking

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to be coincidence. In their efforts to keep warm in their already crowded barracks, the men would pay little attention to ventilation; cases of the actual disease were already present, some in the prodromal stages, and with conditions ideal for transmission, the sudden upshoot of the incidence curve is not to be wondered at. Following this first great outbreak, subsequent ones followed almost regularly every fifteen days, as each group in its prodromal stages passed on the infection. A feature strikingly shown is the successive broadening of the incidence waves, obviously resulting from cumulative variations of a day or two in the incubation periods of certain individuals. As has already been noted, measles did not subside for some time after pneumonia and meningitis. Its subsidence can scarcely be ascribed to exhaustion of susceptible material, since a measles census taken prior to the appearance of the first cases showed that about 25 per cent of the command gave no history of having had the disease. This census almost certainly gave an underestimate of the number of susceptibles, since the disease was contracted by a considerable number who claimed to have had it previously.

Aside from the fatal case of hemorrhagic measles already mentioned, practically the entire mortality was due to following pneumonia. According to the base hospital statistics, it amounted to 2.4 per cent in the period from October 1 to February 15.

For the three months more specifically covered by this report, the total number of cases for Camp Funston was 1,339, or 4 per cent, while the corresponding number for Fort Riley was 108, or 3.4 per cent. A striking feature in regard to the latter is the comparative absence of the bi-weekly crests shown in the curve for Camp Funston; these bi-weekly recurrences were shown by occasional single organizations, and these were occasionally reflected in the incidence curve of the camp as a whole. But in this latter the successively increasing, regularly periodical recurrences did not appear. In the incidence in individual organizations it was noted that, in some, measles made its first appearance with a sudden outbreak of several cases on the same day. Such initial eruptions are certainly to be explained as resulting from an initial early case, which escaped detection. The system originally used at the M. O. T. C., of inspecting organizations for communicable disease only after the first appearance of such, made such accidents possible, and is of course open to criticism for this reason.

Meningitis.—The frankly septicemic type of meningitis, with petechial eruption, was almost entirely lacking, few cases showing

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this feature. Aside from this, type of cases deserves no special mention.

A number of the earlier cases appeared in the personnel of the Depot Brigade, from which regular organizations were filled up as need arose. Part of the spread throughout the camp was probably due to this, but a more responsible feature was in all likelihood the fact that a large part of the command came from a district known to be an endemic center of meningitis—Missouri and Kansas.

The state health reports for Missouri give the following information as to epidemic cerebrospinal meningitis there: In 1911 there were 72 deaths; in 1912, 486; in 1913, 526; in 1914, 163; in 1915, 38; in 1916, 42. For Kansas, the only available data are contained in the sixth biennial report of the State Board of Health, for the period January 1, 1911, to June 30, 1912. "During the winter of 1911-12 . . . about 300 cases occurred within the state . . . with a mortality of about 65 per cent." Evidently in these two states there was a marked epidemic of the disease about 1912 and 1913, with rather frequent sporadic cases persisting until 1916, and presumably to a more recent period. A certain number of recruits from this section were undoubtedly carriers; just what proportion cannot be surmised, for by the time systematic cultures were taken they had certainly infected others, so that the later figures for the camp, as presented in this report, cannot be taken as a criterion. In this connection, no prediction of the number of carriers could be ventured from the frequency of actual cases in any given organization. But when larger units are considered, as, for instance, the troops from certain states, it is found that the number of cases and carriers are closely proportional.

Statistics bearing on this point are given below.

Early in the epidemic it was occasionally possible to trace the connection between case and case, or between carrier and case, with some certainty. Plats made shortly after the appearance of the disease showed relationships as regards quarters or association as follows: Case and case, 8; case and carrier, 20; carrier and carrier, 40. As the epidemic progressed, it became more and more impossible to establish this relationship; associations became more complex, as men were shifted in adjustment to the new arrangement of quarters, number of carriers was probably undergoing a constant increase; and, even more important, it is probably a fact, as will be shown later, that the majority of meningitis carriers are such for comparatively short spaces of time, the organisms tending to disappear spontaneously, so that the infection may have been borne by an inter-

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mediate agent, whose relation in the matter could not be traced because of disappearance of the organisms in him by the time he was reached for culture.

In view of the fact that a portion of the troops at Camp Funston came from an endemic center, and part did not, it would be of much interest to ascertain the proportion of carriers in the several groups. Obviously, only the earlier carriers would show a typical geographical origin, if such occurred. There follows a table showing this origin for the first 186 carriers:

Missouri	68	Colorado	7	Nevada	2
Kansas	61	New Mexico	6	S. Dakota	3
Nebraska	35	Arizona	1	Iowa	1
Oklahoma	2				

The following table shows the geographical origin of the first 95 actual cases of the disease:

Missouri	34	Colorado	3	S. Dakota	4
Kansas	32	Arizona	4	Arkansas	1
Nebraska	16				

The proportionate personnel from each of these states could not be ascertained; but the quotas from Kansas and Nebraska were very nearly equal, so that evidently both carriers and cases were more frequent, both relatively and absolutely, in men from endemic areas. The close proportional relationship shown between cases and carriers, referred to above, is indicated in the above tables.

Mortality from meningitis was, in the early part of the epidemic, high. The following figures are from the base hospital records:

Month	*Cases*	*Deaths*	*Per cent mortality*
November	73	29	39.9
December	36	8	22.0
January	20	4	20.0

They simply illustrate anew the diminution of virulence which ordinarily accompanies the subsidence of an epidemic.

At the M. O. T. C., meningitis never assumed epidemic proportions. The first case did not occur until December 29; on January 11 there were two cases, one an enlisted man, the other a student officer. On January 20 another case occurred in a student officer, and there were two more cases in enlisted men, one on January 27 and one on February 3. This immunity is probably in part at least due to the prompt institution of preventive measures, which had been thoroughly worked out by the preliminary experience of Camp Funston. The data of the carrier situation for

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the M. O. T. C. follow; a rather surprising fact is the much higher frequency of carriers here than at Funston, in spite of the much more varied geographical origin of the personnel. But the two figures are not strictly comparable; culturing at Camp Funston was begun much earlier than at the M. O. T. C., with prompt removal of the carriers detected, with consequent lessened exposure of others. At the M. O. T. C., where the first case appeared so much later, culturing was not begun until that time, and any carriers who may have been present originally had ample time to spread the infection. The question naturally arises as to why cases did not appear earlier at Fort Riley, if the foregoing assumption is correct. The only probable answer would be that contributing conditions were not there present to such a degree as to actually give rise to the disease. Probably none of the various contributing causes was at any time as acute as in the period at Camp Funston when these diseases first assumed epidemic proportions.

The incidence of carriers at Camp Funston is shown in the following table; the figures obtained in October, November, and February were the result of cultures made in organizations exposed to the disease; in December and January they represent the results of two cultures of the entire camp:

	Cultures	*Carriers*	*Per cent*
October	2,713	68	2.5
November	11,951	410	3.43
December	28,759	993	3.45
January	26,969	925	3.43
February	2,692	97	2.6

At the M. O. T. C., the 362 carriers already mentioned were obtained with a total personnel of about 3,600, giving approximately 10 per cent carriers. The percentages for the two camps are not strictly comparable, but are sufficiently so to indicate the higher percentage of carriers at the M. O. T. C.

A study of 2,831 meningitis contacts and carriers—mostly the latter—who were sent to the Camp Funston quarantine camp in the period considered here, shows the following cultural histories:

One or no positive cultures after admission	2,753
Two positive cultures after admission	21
Three positive cultures after admission	3
Admitted twice in less than one month	24
Admitted twice with over one month between admission	28
Admitted three times	2

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MENINGITIS CARRIERS AT FORT RILEY

Carriers	*Successive neg. cult. after 1st*	*Intermittent neg. cult.*	*Developed meningitis*	*Incomplete*
362	308	21	1	37

These data throw some light on the frequency of chronic carriers as compared with more transient hosts. Evidently most so-called carriers belong to the latter class; even if all the cases enumerated after the first item in the above tables be viewed as true chronic carriers—an allowance almost certainly more liberal than the facts warrant—their relative frequency is slight.

Preventive Measures—General.—Of these the most important for Camp Funston were:

Provision of more ample barrack capacity per individual, proper warming of barracks, enforced ventilation, more suitable clothing, and dust alleviating measures, principally the liberal use of oil. Certain special measures were also of at least equal importance: the establishment of a quarantine camp, and somewhat later of a detention camp for new arrivals, and enforcement of an alternating head to foot arrangement in sleeping. This has been recently replaced by the institution of extemporized cubicles, improvised from shelter-tent halves, the bed being placed about 1½ feet from the wall. A photograph of this is shown in Fig. 1. At the M. O. T. C., most of the above measures were also instituted; proper ventilation was secured by a system of regular nocturnal inspections and barracks were thoroughly aired during the day, when the occupants were absent. Clothing and personal equipment were aired daily.

During the height of the epidemic at Camp Funston, and for a period afterward, all places of public assemblage were closed. The use of the electric trolley line for purposes of ingress and egress to the camp was prohibited, and the Camp Funston personnel was by divisional orders, forbidden to frequent places of public assemblage at the nearby cities of Manhattan and Junction City.

Special Measures—Pneumonia.—Only general preventive measures were practiced against this disease at both camps. It was originally intended to isolate the more immediate pneumonia contacts, but the bacteriological evidence against interhuman contagion was such, as has already been stated, as to make this seem unnecessary.

Measles.—In addition to the general measures directed against respiratory diseases, as enumerated above, the precaution was taken in the case of measles, at both the M. O. T. C. and Camp Funston,

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of prompt removal not only of actual cases, but of contacts as well. At Camp Funston these were regarded as being the occupants of the beds on each side of the patient, at the M. O. T. C., of two beds on each side. Such contacts were kept under observation for the incubation period of the disease. From the fact, as shown below, that comparatively few of these contacts developed the disease, this measure appears to be of questionable value. An additional measure practiced at both camps was probably of more importance, and in the case of the M. O. T. C. appears to have been largely responsible for keeping the disease down. In any organization showing a case of contagious disease,—at Camp Funston in all organizations—the entire organization was inspected twice daily for any disease of this character. All certain or suspicious cases were removed, and, if necessary, placed under observation until an exact diagnosis could be made. Even though in most cases of measles the patient was not detected until the appearance of the rash, the measure appears at the M. O. T. C. to have checked recurrences. In the few cases where recurrences did occur, it was usually possible to definitely prove that they were due to an oversight on the part of an inspector, in one case due to the fact that the patient was temporarily absent from the barracks. At Camp Funston the measure was less effective, for probable reasons that will be discussed later.

Meningitis: Special.—Prophylactic measures for this disease were principally directed toward the prompt detection and isolation of carriers. The system in use in the two camps was practically identical, having been evolved in the course of the Funston epidemic. In the early days of the latter every organization showing a case of meningitis was at once quarantined in its barracks, pending the results of a culture, made as soon as possible after the appearance of a case. Later in the epidemic this quarantine was lengthened until the results of two such cultures were learned, as experience quickly showed that one culture was insufficient to detect all carriers. As soon as the base hospital laboratory facilities were sufficient, a routine culture of every individual in the camp, both civil and military, was taken, and all carriers placed in isolation. This routine culture was later repeated.

During the period of quarantine, both of companies while awaiting the result of culture and of carriers after detection, prophylactic treatment of the nasopharynx was instituted. At first this consisted of a preliminary douching with a sodium bicarbonate and salt solution, followed by spraying with an aqueous and an oily solution of dichloramine-T. However effective this treatment may have been as a disinfectant, it was found to give rise to a consider-

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able number of cases of otitis media, and the treatment was changed to a simple swabbing of the pharyngeal passages with a 2 per cent silver nitrate solution, followed by an oily solution of iodine. This was, when practicable, done twice a day; considerable care was necessary to avoid undue irritation of the pharynx; otherwise the treatment was satisfactory.

At the M. O. T. C. the prophylactic treatment was even more simplified, and consisted of instilling into the nostrils sufficient 2 per cent argyrol solution to trickle down into the pharynx. This treatment was primarily devised to avoid harm; it seemed to clear up carriers as quickly as the other, but there is some evidence that the usual meningitis carrier clears up spontaneously and quickly in the complete absence of treatment.

Isolation Camp.—At both Camp Funston and the M. O. T. C. there were established isolation camps for the segregation of such as might be expected to bear a part in the transmission of communicable respiratory diseases. At Camp Funston the camp was first intended to house pneumonia contacts, meningitis contacts and carriers, and measles contacts, together with such as might be considered as incidential to the transmission of other communicable diseases. Thus at this camp there were from time to time a number of diphtheria carriers, scarlet fever contacts and the like, but as these diseases did not at any time assume epidemic proportions, no space has been devoted to them in this report. For reasons already given, it was not considered necessary to handle the type of pneumonia met at Funston as a highly communicable disease, so that the camp was not used, as originally intended, for pneumonia contacts. Originally both meningitis contacts and carriers were sent here, but it soon developed that the capacity of the camp could not accommodate the entire number of both these, for all members of an organization in which there developed cases of the disease were considered as being the former; accordingly the system of quarantining such organizations in barracks until carriers had been removed by repeated culture was returned to, and only carriers were sent to the camp, where they were held until they showed three successive negative cultures. The procedure with measles was to regard as contacts occupants of the beds on each side of the case, and to hold these for fifteen days, or, in the event of a case appearing in their tent at the camp, for that period after the appearance of the last case.

To secure as great a degree of segregation as possible, the inmates of the camp were housed in tents, originally with six men in each; later, at the direction of the Surgeon General, with five only. Occupants of any tent were forbidden to visit others, and the whole

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scheme of the camp was arranged to prevent various tent groups from mingling indoors. For this purpose, the men obtained their food at the nearest kitchen and retired to their tents to eat it; screened open-air pit latrines were used, and for cultures and prophylactic treatment the men were admitted to the buildings used for the purpose one tent group at a time. Sick call was held within the tents, the medical officers visiting each tent for the purpose. Outdoor mingling of the men for drill and amusement was permitted within the zone for any one disease. A copy of the rules, for the guidance of the men while in camp, follows. One was posted in each tent, and the men were held responsible for their observance:

HEADQUARTERS DETENTION CAMP

MEMORANDUM

CAMP FUNSTON, KANSAS,
December 1, 1917.

I. The following orders and regulations are adopted for the interior administration of the Detention Camp, Camp Funston, Kansas, and will be rigidly enforced. Company commanders will take all steps necessary for their enforcement within the area allotted to their companies, will prescribe the necessary guard details from their companies, and will make such inspections as may be necessary to see that orders and regulations are being complied with.

1. Within the same tent, men will occupy only their own cots and will use only their own clothing, bedding and toilet articles. No articles of oral use will be used by the members of any tent in common. Men will be warned against the danger of sneezing and coughing towards each other, as well as talking loudly when close together, for it is by these acts that meningitis and other respiratory diseases are spread.

2. Tents, bedding and personal possessions will be sunned and aired whenever the weather permits, tents being furled at peak.

3. No person in quarantine will enter any tent other than that to which he has been assigned as quarters.

4. No person in quarantine will leave the area assigned to the company to which he belongs at any time, except when the company leaves camp for the purpose of drill and instruction. When the company leaves for drill or instruction, it will at all times be under the command of a commissioned officer.

5. All mess equipment will be scalded immediately after use.

6. The pollution of the area around the tents or kitchens by careless handling of remnants of food or drink or in any other way will be prevented.

7. Guards will be required to prevent all unauthorized persons from entering or leaving the Detention Camp or from passing through or along the area occupied by it.

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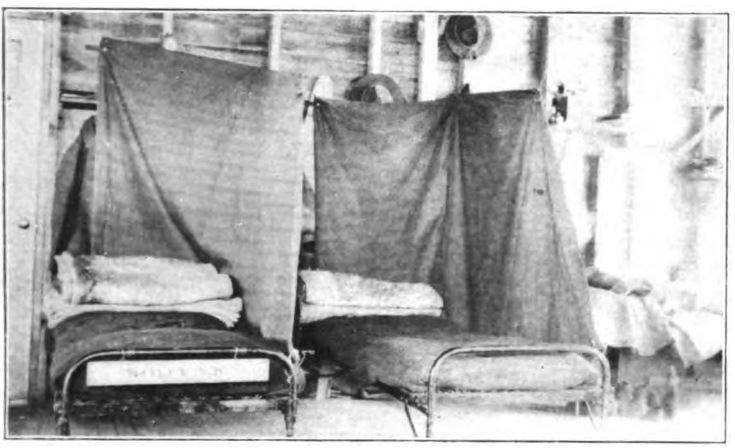

FIG. 1.

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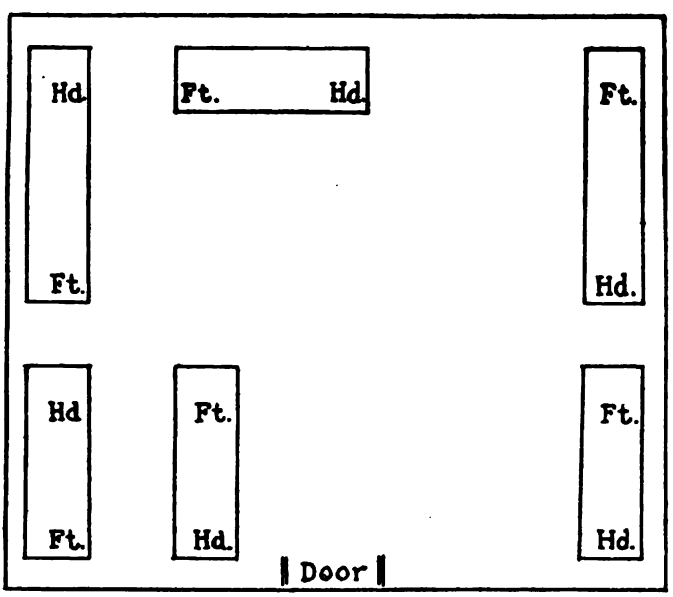
8. Meals will be served to men in tent groups at the various kitchens, and food will be taken to tents to be eaten. A noncommissioned officer will be detailed for duty at each kitchen during hours when meals are being served to prevent the mingling of tent groups.

9. Such system of ventilation as may be prescribed in each group by the surgeon will be enforced by at least two inspectors each night.

10. The receiving office for all troops being sent to the Detention Camp will be located in the barrack building formerly occupied by the 21st Cavalry Band in the cantonment.

11. Six men will be the maximum number placed in any tent. When organizations with full complement of officers and noncommissioned officers are received in Detention Camp, the north tent of the company row of tents will be reserved for use of the officers of the organization and the next tent will be used as an orderly tent. When provisional companies are organized from detachments arriving in camp, the north tent of the company row will be reserved for officers, the next tent for the noncommissioned officers assigned for purpose of drill and instruction, and the third tent for an orderly tent. The tent nearest each kitchen will at all times be reserved for mess attendants.

12. Bunks will be arranged so that no two men contiguous to each other have their feet extended in the same direction. The following arrangement of bunks has been adopted, and will be followed in the arrangement of each tent:



By Order of Colonel Hutton.
Robert F. Glen,
Captain, Infantry, N. A., Adjutant.

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In addition to the sick call, twice daily each tent was visited by an inspector for the purpose of early diagnosis of communicable disease. Inspectors for this purpose were assigned from student officers at the M. O. T. C., partly to assist in the work, partly for purpose of their own instruction. Schedules for these inspectors were so arranged that no man inspected the same personnel on two successive occasions. A senior medical officer, an instructor from the M. O. T. C., supervised the inspectors, made out their assignments, and checked up doubtful cases.

The quarantine camp, as outlined above, was opened December 6, with a capacity, at the rate of six men per tent, of not quite three thousand men. Previous to the opening of this camp, its place had been taken by a temporary camp established as an adjunct to the base hospital. Because of the emergency need for this, and because of its temporary character, it was not as carefully organized as the later camp, and such data as are given pertaining to the quarantine camp are based on the later camp alone.

Meningitis in the quarantine camp was almost negligible. Only four confirmed cases were sent to the base hospital; one of these was in quarantine at the time as a measles contact.

Measles.—For the period in consideration, an analysis of 3,260 inmates of the quarantine camp, sent there as meningitis contacts or carriers, or as measles contacts, gives the following results: Admitted as meningitis contacts or carriers, 2,831; cases of measles among these, 90, or 3.18 per cent; admitted as measles contacts, 429; cases of measles among these, 15, or 3.5 per cent. Evidently, the rate of occurrence of measles among measles contacts was only slightly greater than among men quarantined for other causes.

Pneumonia.—Sixteen cases of pneumonia developed at the camp, distributed as follows: Measles contact, 1; meningitis carrier, 14; mumps contact, 1.

The quarantine camp at the M. O. T. C. was run on lines similar to that of Camp Funston, but necessarily on a smaller scale. Because of the smaller personnel at this camp, it was possible to use it for purposes which would have overcrowded the Funston camp. Tonsillitis, coryza, and other minor diseases were quarantined here, as well as the more serious diseases.

Detention Camps.—At both the M. O. T. C. and Camp Funston there were inaugurated independently detention camps for the separate housing and observation of newcomers to the camps, both new recruits and men returning from leave. Practically the same

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rules were applied to these as to the quarantine camps, including the twice-daily inspections. Like the quarantine camps, they were made up of tents, to permit of the maximum amount of segregation that was practical. Inmates were kept here until the incubation period for the various respiratory diseases was past, and they had been shown to be free from meningococcus infection by two successive negative cultures, one at least made just prior to their discharge.

Discussion.—The relative situations at Camp Funston and the M. O. T. C. present some interesting contrasts, the more striking because of the similarity of the two camps in some respects, particularly climatic conditions. In both camps the same principal diseases were present. The incidence of pneumonia in each was not strikingly different. With measles, Camp Funston had an incidence approximately that of the M. O. T. C., but differing in the much greater prominence of bi-weekly recurrences. With meningitis, there occurred at the former camp, in the three months specifically covered by this report, 119 cases; while during a considerably longer period at the M. O. T. C. there were only six, about half the relative proportion. What factors, if any, can be found to explain these differences?

The principal differences in the personnel at the two camps were: (1) The enlisted men at the M. O. T. C. had, for the most part, been in the service longer than those at Camp Funston, and so were, presumably, more accustomed to army life. But in very many cases this discrepancy was not great, and, while it may have been a factor, it was not an important one. (2) The enlisted personnel at the M. O. T. C., as has previously been mentioned, arrived mostly from recruit barracks, while that at Funston came directly from home. This would operate in two ways—the recruit barracks would afford an opportunity for infection previous to arrival at camp; that it did actually do so is shown by the arrival at Fort Riley of one contingent from such a depot in which there very shortly developed cases of diphtheria, measles and scarlet fever; also, 11, or 10 per cent, of the M. O. T. C. measles cases developed within fifteen days of their arrival at the camp. On the other hand, men arriving from scattered homes would bring into camp possible infections which may have existed there; so that it would appear as if the one practically offset the other. The shifting civilian population present at Camp Funston in its early days would, of course, increase the opportunities for infection there.

As regards general conditions, these were not strikingly different

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at the two camps, although they were somewhat worse at the newer camp—Funston. The same degree of crowding as was present for a time at Camp Funston probably was at no time present at the M. O. T. C. Warming of barracks was more quickly achieved at the latter camp, where stoves were installed on the onset of cold weather, whereas at Camp Funston they were forced to await the installation of a steam heating system. Direct comparison of ventilation cannot be made, but it was probably better at the M. O. T. C., where the responsible medical officers had direct command over the entire personnel. As to clothing, Camp Funston procured its winter supply at least as promptly, and probably more so, than the M. O. T. C. Dust was never quite as bad at Fort Riley as at Funston, owing, in part, to the smaller personnel, in part to its higher location. But with the prevailing northerly winds, a goodly proportion of Camp Funston's supply reached the other camp. On the whole, while general conditions favored the M. O. T. C., the difference was not very striking.

There remain to be considered the special preventive measures. In general, these were practically identical at the two camps, but differed in detailed application. It has already been intimated that the principal artificial factor in keeping down measles at the M. O. T. C. was thorough daily inspection, with removal of cases, suspects, and, probably of less importance, contacts. This same system was used at Camp Funston, without the same striking results. But at Camp Funston the only personnel available for these inspections was the commissioned regimental staff, while at the M. O. T. C. there was constantly a large staff of student medical officers, who could be, and were, assigned for the purpose. If it be remembered that the regimental staff had these inspections in addition to a large number of other duties, it appears probable that the increased efficacy of this measure at the M. O. T. C. lies in the greater thoroughness which might be expected. An additional element at Camp Funston was the fact that in the earlier period of the camp there was a large shifting of personnel from one organization to another in the effort to adjust men to their peculiar abilities. Also, the enlisted personnel at the M. O. T. C., practically all of whom were volunteers, was almost certainly more largely urban in origin than that of Camp Funston, where the men were drafted from States whose population is largely rural.

With meningitis, the much later occurrence of this disease at the M. O. T. C., in spite of its higher proportion of carriers, points

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toward a lower susceptibility on the part of its personnel. This, in part, may be explained by the fact that a very considerable number of the carriers were found among the student medical officers, most of whom were beyond the age of greatest susceptibility to the disease itself. In addition, the M. O. T. C. was able to profit by the system used in combatting this disease at Camp Funston, which was evolved there, largely experimentally, before the appearance of the M. O. T. C. cases.

The relation of carriers to the meningitis situation is an interesting and somewhat obscure one. It seems almost absolutely established that the usual so-called meningitis carrier is not such in the strict sense of the word, but merely a usually transient host. Only in this way can be explained the prompt disappearance of the organisms, in some cases quite without local treatment. The proportion of cases in which the organisms have not this transient character is, as has already been shown, small; this small number are quite probably to be viewed as true carriers. As regards the relation of the transient "carriers" to the disease itself, the fact must be borne in mind that, at least as shown by the epidemic under discussion, they very rarely contracted the actual disease. The most obvious explanation would be to regard certain individuals, possibly true chronic carriers, as primarily responsible for the dissemination of the organisms to a large number of others. Certain of these may contract the disease. In certain others, and probably the majority, the organisms gain entrance to the pharyngeal mucosa, where they may live for a variable period of time, but without setting up the disease; such individuals we should consider as having a relatively high natural immunity. And this very immunity would then explain the low incidence of the disease among "carriers" of this class. It might be expected that there would be an intermediate series of individuals in which the meningococcus might set up the systemic infection which there is reason to believe, in some cases at least, precedes the actual meningeal infection, without going on to the latter. Of the cases sent from the quarantine camp to the base hospital with symptoms suggestive of meningitis, comparatively few actually showed meningeal infection on lumbar puncture, and it is possible that the remainder come under this hypothetical intermediate group. The importance of the transient carriers in the transmission of the disease cannot be defined exactly. *A priori*, organisms transmitted from one immune individual to another should gradually lose in virulence, but whether or not such loss would ever be sufficient to render them innocuous is, to say the

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least, very problematical; and it has been possible in a few cases at Camp Funston to apparently show the connection between carriers, some of whom, from the scarcity of the chronic type, were almost certainly of this transient sort, and actual cases of meningitis. In any case, it would be very rash to consider these individuals as anything but potential sources of danger. It would seem that carriers of meningitis must be viewed in the light of being the spark capable of kindling an epidemic only when suitable fuel is present, the fuel being a personnel made more than ordinarily susceptible by various extraneous factors, some of which have been enumerated in the introductory paragraphs of this report. Evidently, there are two distinct ways of meeting a threatened epidemic of this disease—by elimination of the predisposing factors on the one hand, by removal of the element of infection by prompt detection and isolation of carriers on the other. Either alone would suffice if it could be made absolute, but in the absence of this unattainable optimum the logical method would embrace measures devoted to the control of both elements.

Conclusions.—As a result of the situation just discussed, the following prophylactic measures against respiratory disease appear to be of principal importance:

1. General care of hygienic conditions; provision of sufficient warm clothing, ventilation, adequate housing space; elimination of dust; elimination of the danger of direct personal transmission, at night particularly, either by increasing the distance between individuals as greatly as possible, as by the alternate head to foot sleeping arrangement, or, preferably, by the extemporization of cubicles.

2. In the case of pneumonia, with the more usual types of pneumococcic infection, it might be advisable to segregate contacts; just to what degree would have to be determined by bacteriological controls, to which the situation here discussed did not lend itself.

3. For measles, regular inspection, preferably twice a day, of entire personnel, to be made with men stripped to the waist. Observation of pulse rates would greatly increase the efficiency of these inspections, as giving indication of possible fever.

4. For all diseases of this type, prompt removal of all cases and suspects. Contacts for measles are of doubtful importance.

5. For meningitis, repeated routine culture of the entire personnel, preferably even before the appearance of actual cases, with prompt removal of all showing positive cultures, especially with troops assembled from endemic areas.

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6. The institution of quarantine camps for individuals removed as dangerous. Such camps should be made up of small units, to admit of the maximum degree of segregation and to permit of shifting inmates as disease conditions may indicate. No indoor mingling of occupants of different units to be permitted. Inmates to be kept here for the full incubation period of disease for which quarantined, or until shown to be harmless by repeated culture.

7. The institution of detention camps, at which all newcomers, be they new recruits or men returning from leave, may be kept until it has been shown that they are not harboring infectious disease. This camp to be governed exactly as the quarantine camp, but of course separate from it.

8. A factor not discussed in this report, but probably capable of yielding good results, is education of both officers and men as to the possibilities and dangers of transmission of diseases of this type, both as regard personal and general hygiene.

REPORT—INSPECTION OF CONTAGIOUS DISEASES

By Major Ellis K. Kerr, M. R. C.

With the report of Major Eggers on the occurrence of communicable diseases in the M. O. T. C. and at Camp Funston, some further discussion of the situation from a purely military viewpoint is in order. It is particularly important to arrive at a definite conclusion as to handling contagious diseases in order that the methods of handling may be standardized, and it is essential that a definite plan be adopted for this department, so that the student officers may be properly trained. The importance of standardizing methods is obvious. The difficulties in so doing lie in the great variance in the views of different men regarding methods of handling diseases. Our observation has led us to some very definite views, and we feel able to lay down some principles that, if adopted, will go far towards a unification of methods.

With the remarkable control over typhoid fever attained since the use of vaccines, important communicable diseases are those in which infection is entirely or largely through the respiratory tract. The most important of these are mumps, measles, pneumonia and epidemic cerebrospinal meningitis. Regarding this group it is possible to lay down certain general data. Thus overcrowding, poor ventilation, lack of heating facilities, insufficient clothing, improper food, and particularly dust, are important factors, and must be corrected in all cases if results are to be obtained. It is worthy

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of comment that measles, pneumonia and meningitis appeared together at Camp Funston. Measles ran wild at Camp Funston, and continued in a lesser degree at the M. O. T. C., till almost at the same time it stopped in both places. Mumps ran about parallel in the two camps. Pneumonia and meningitis reached their crest at about the same time at Camp Funston, and declined together, in spite of the fact that, outside of the general methods, nothing was done for pneumonia and many special features were adopted for meningitis.

The Diseases in Detail.—(1) *Measles.*—As a camp problem, measles is by all odds the most important disease. It is always present, in spite of all precautions, and is dangerous to life and subsequent health on account of its complications and sequelae. It is not controlled by the general measures mentioned above. Major Eggers' report shows its occurrence at Camp Funston and in the M. O. T. C. At Camp Funston the disease kept recurring in each company with peaks more or less marked every ten to fourteen days. At the M. O. T. C., except in a few instances, the cases were scattered, and, while there may be several cases over a period of two to six days, there were in only a few cases recurrences in the same organization within the usual incubation period of the disease. Both camps enforced dialy inspections, and both isolated cases and contacts. The difference lay in the character of the inspections. At Camp Funston these were made by the regimental men, who had had no special training for this work and often did not appreciate its importance. In the M. O. T. C. inspection was done by specially selected trained men who were particularly interested in the handling of contagious diseases. It is worth noting that the few recurrences that occurred could be traced to carelessness in inspection. Other factors were the same in both camps, and it seems unavoidable that the difference lay in the character of the inspections.

2. *Mumps.*—Mumps is the most prevalent disease next to measles. It is like measles in difficulty of control, but is less serious, in that its complications are less dangerous. Even inspection has done little good in its control. Again the disease subsided in both camps at the same time.

3. *Pneumonia.*—The cases of pneumonia were mostly due to the Type IV organism, and were too few to draw any conclusions from. The disease seems to have been controlled by general factors.

4. *Meningitis.*—Meningitis is not as frequent as pneumonia or measles, but presents an important problem because it inspires

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dread in the people, who are less used to it than to measles and pneumonia. It has also a relatively high death rate, and the treatment, while efficacious, is very distressing to the patient. Certain facts regarding its incidence and character are well brought out by our observations. It is particularly a disease of recruits rather than of trained soldiers, and depends upon the general factors mentioned above, as shown by its decline, together with pneumonia, when the general conditions were improved. Fatigue and lowered resistance, due to other infections, are important factors in its development, and in view of the prophylactic measures that are usually taken in new recruits, as well as the almost universal colds on coming to camp, it would seem wise to begin the training of recruits very gradually, in order not to tire them too much. The virulence of the organism varies markedly, as shown both by the incidence and by the severity of the cases. That the virulence varies also in the course of any epidemic is a common observation. When the virulence is marked there is additional reason for taking every precaution to prevent spread.

Our data on carriers bring out some interesting facts. Early in the study of a group it is possible to make out the steps of contagion from case to case. Later this cannot be done, for the reason that many carriers are so for a short time only and are cleared up by the time cultures are made, thus losing intermediate hosts. We must distinguish these temporary hosts from real carriers. The number of cases developing has no relation to the number of carriers or hosts. The ideal handling of meningitis would be to segregate a company as soon as a case develops in tents holding as few men as possible each, but not over four. Then cultures would determine the hosts, and repeated cultures the carriers. No treatment is necessary or advisable. The training should be lightened, but not stopped. Less than a week would be needed for a complete study of the situation when carriers, if found, are removed to the isolation camp for future study and the rest returned to regular work. When the cases are scattered and too many different organizations effected for this method, the companies can be put under temporary partial quarantine with lightened work, cultures made, and hosts removed to an isolation camp. Where the evidence warrants it, the entire command should be cultured once, or, better, twice. This is particularly necessary when the men are from an epidemic area. If this is done and the new men coming into camp held in detention for two cultures, the disease can be controlled.

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This was well shown at Camp Funston. The efficacy of removing hosts was shown at the M. O. T. C. This camp remained free from meningitis till late in December, when a case developed in a mumps patient. In December a large number of medical officers arrived in camp and two cases of meningitis developed among them in January. Cultures were immediately made, first of the student officers and later of the entire camp. In the medical officers, in repeated cultures, a total of fifteen (19 per cent of each company) were removed as hosts. Seven men were positive on more than one culture, and these men are being held for future study. In all there were six cases, the last being on February 3, 1918. Since the cultures, all incoming men, commissioned and enlisted, have been held for two negative cultures. Our experience illustrates the rapidity of spread of the organism among new men when put into barracks under camp conditions. Beyond stringent rules about ventilation and insistence on alternate head and foot sleeping, no other measures were instituted. It would seem to be proven that removal of hosts is well worth while. Surgeon O. J. Mink, U. S. Navy, considers it useless, and objects to the necessary interruption of the training. The latter need be very brief and is not worth considering. At least this seems a logical conclusion in the present state of our knowledge. Certain technical matters are worth noting.

1. *The technique of cultures.*—We have used the nasal route exclusively, as being quicker and requiring little training. With our technique the speed is regulated by the ability of the laboratory to handle the cultures. We feel that, even if the method is not as efficient as others, a speedy removal of the bulk of the carriers is more important than a slower, even if more complete, removal. With two cultures, the method is more accurate than one of any other, and takes about the same time.

2. The *handling of the field end* of the cultures needs special training. To get all the men in various organizations and to coördinate the field and laboratory work is a special problem, and requires executive ability.

3. The *laboratory problem* is important, inasmuch as the laboratory determines the speed of culturing. Plentiful supplies are needed, but the main difficulty is in getting trained men. This will be considered later.

4. *Diphtheria.*—While a dangerous disease, its handling as a camp problem is easy. Cultures, with removal of carriers and isolation of all questionable cases, should stop the spread.

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5. *Scarlet fever.*—Inspection, with removal of cases, is all that is necessary. Quarantine is not necessary here, nor in any other of these diseases, except for short periods pending a report on results of cultures where these are advisable.

As a military problem, the question of who is to do the work is important. The entire matter is, of course, under the division surgeon and the sanitary inspector. Lately there has been added an epidemiologist, who is under the direction of the sanitary inspector, and whose duty is to direct the handling of communicable disease. Inspections have been done by the regimental surgeons, and it would seem that this is the only solution possible. It would be impossible to furnish enough inspectors to do all the work. It would be feasible to add assistant epidemiologists, with the idea of checking the inspections of the regimental men and of instructing them in their part of the work. The handling of an isolation camp requires some special training and experience. The meningitis problem requires two groups—the field force and the laboratory force. Taking cultures does not require a laboratory man, but does require men who have been specially trained and who have had lots of practice. The director of the field force must have considerable executive ability and must know the game thoroughly. As for the laboratory end, this is a highly specialized matter, and there must be an efficient director. The assistants could be trained for this special work in a short time if they were the right sort. While each camp has a laboratory, this is, as a rule, busy with routine matters, and cannot expand to meet sudden demands. It would be better to send a flying squadron, so to speak, to any camp where meningitis is a menace, such a squadron to be made up of a field director, with assistants, to do the culturing, and a laboratory director, with assistants, to take charge of the meningitis cultures alone. This squadron could draw on the regular medical personnel for further assistance, if necessary, but would be a trained nucleus that would insure uniformity of results.

The reason for a thorough discussion of the problem of how to handle communicable diseases at this time is for the purpose of outlining a proper course of action in the Medical Officers' Training Camp. We are training a group of men in this department, but are working, more or less, in the dark. Some of the men are now in ordinary sanitation, and are in line for sanitary inspectors. We have sent out a few men as epidemiologists. We have left men available as epidemiologists, directors of isolation camps, field directors and assistants in meningitis culturing. We have in the

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past furnished men to the laboratory, but men already well trained are scarce. It should be possible to furnish men who could be trained for this special work in a short time. It would be possible then to train the flying squadrons mentioned above in a limited number. It is necessary, however, to hold a nucleus in the camp to train new men, and the number to be trained depends upon the necessity for them. So far, there has been only a limited demand, and only for epidemiologists. It would make quite a difference in our future course if we could have a ruling as to what men are required and in what number. Our routine work is extensive, and, apart from those specially qualified, we are giving a valuable preparation to a number of men who are going into regimental work. This and our student courses will undoubtedly raise the standard of regimental inspections.

On the basis of our study and experience, the following recommendations are offered: (1) That the work of the department be given to as large a percentage as possible to men in line for regimental assignments. (2) That the present scheme of coöperation with the Department of Sanitation be continued. (3) That certain men be trained in all features of the work, so as to be available as epidemiologists. (4) That the attention of the Surgeon General be attracted to our work, and the following suggestions made: (*a*) That one or more assistant epidemiologists be assigned to each camp to instruct the regimental men in inspection for communicable diseases. (*b*) That specially trained men to take charge of isolation and detention camps are advisable. (*c*) That flying squadrons to take over meningitis cultures be formed, or, at any rate, be listed and held where they will be available, these squadrons to be made up of a field chief and assistants to handle the cultures and a laboratory chief and assistants to handle the laboratory work. (*d*) With the organization we have and the size and character of our camp, we can train men for this work, and we feel that this is advisable.

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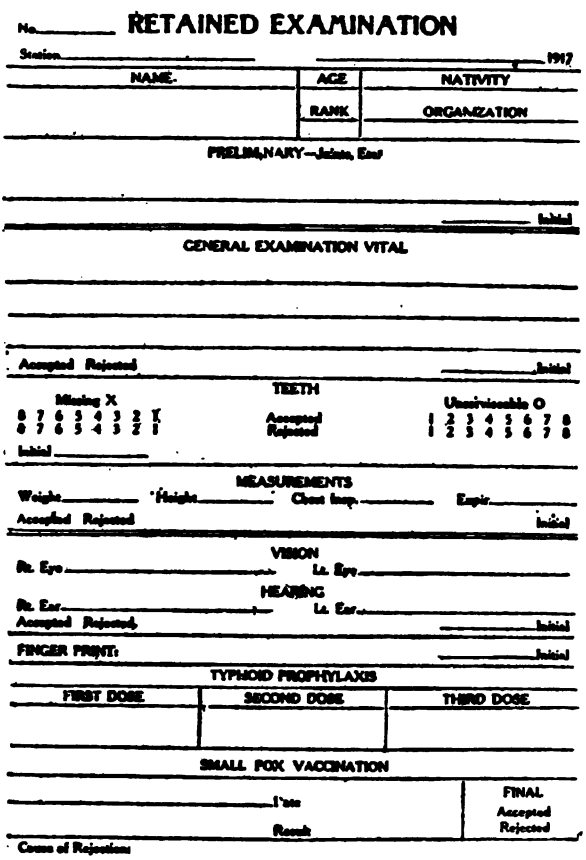
A REPORT OF PHYSICAL EXAMINATION OF TWENTY THOUSAND VOLUNTEERS

By Major Clarence L. Cole, *Medical Corps*, U. S. Army; Captain E. W. Loomis, *Medical Reserve Corps*, U. S. Army, and First Lieut. Eugie A. Campbell, *Medical Reserve Corps*, U. S. Army.

(With fourteen charts)

(*Concluded*)

THE physical examination card used in this work is identical with the retained examination card used in the Texas examination. The card is 8 by 5 inches. The use of such a card facilitates exam-


No._____ RETAINED EXAMINATION

Station_____ _____ 1917

NAME. | AGE | NATIVITY

RANK | ORGANIZATION

PRELIMINARY—Initials, Date

_____ Initial

GENERAL EXAMINATION VITAL

Accepted Rejected _____ Initial

TEETH

Missing X

8 7 6 5 4 3 2 1 | 8 7 6 5 4 3 2 1

Accepted Rejected

Unserviceable O

1 2 3 4 5 6 7 8 | 1 2 3 4 5 6 7 8

Initial_____

MEASUREMENTS

Weight_____ Height_____ Chest Insp._____ Expir._____

Accepted Rejected Initial

VISION

Rt. Eye_____ Lt. Eye_____

HEARING

Rt. Ear_____ Lt. Ear_____

Accepted Rejected _____ Initial

FINGER PRINT: _____ Initial

TYPHOID PROPHYLAXIS

FIRST DOSE | SECOND DOSE | THIRD DOSE

SMALL POX VACCINATION

_____ Date

Result

FINAL

Accepted

Rejected

Cause of Rejection

ination for the following reasons: (1) The notes are made in serial order as the candidate passes each examiner. (2) The card permits scratch notes. (3) It serves as a permanent record at the office of

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the chief examiner after serving as a check blotter for compiling permanent records which are to be forwarded. (4) Through its use there is no necessity for entering any remarks upon any official paper, as Form 17 A. G. O., a part of which has been prepared by another office until all the evidence relating to the man has been assembled. This avoids the attendant delay which follows when erroneous entries have been made upon these final papers.

The statistics herein presented were compiled from the physical examination cards forwarded by district examiners. Each man was examined under state supervision prior to appearing for initial muster. The results of the examination are shown in statistical tables. These charts and tables will be discussed with a view to bringing into prominence facts pertaining to three important points: (1) The probable number of men accepted who are certain to require medical or surgical treatment before becoming efficient soldiers. (2) The probable number of men discharged who might be saved to the service by proper medical or surgical treatment. (3) The medical or surgical provision necessary to put the greatest number of these men in perfect physical condition.

The chart entitled "Table of Men Examined" gives the result of the examination for the entire number of men. All men appearing for examination are accounted for in one of the four groups: (1) Accepted; defects noted. (2) Accepted; defects waived. (3) Accepted; no defects noted. (4) Discharged; defects not waived.

Under the caption "Causes of Rejection" there are given titles of the general groups of defects found. As many men had more than one defect, it must be understood that, in the preparation of the chart entitled "Table of Men," only the principal defect was noted as the record of its importance appeared to the examiner. The chart entitled "Table of Defects" found in men examined differs quite materially from the first table for obvious reasons. Discussion of physical defects in soldiers must be considered primarily as to the number of men who have these defects, for the reason that the number of men is more important than the number of defects. Hospital facilities for correcting disabilities found on an examination of this character must be planned primarily for the men found defective, and the number of conditions which require treatment in these men can be provided for in staff organization.

REPORT OF EXAMINATION

Thirteen thousand five hundred and eighty-four men were included in the report of examination. Four thousand two hundred and

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NATIONAL GUARD, STATE of TEXAS.

RESULTS of PHYSICAL EXAMINATION at MOBILIZATION, UNDER CALL of the PRESIDENT, AUGUST 5th 1917.

ORGANIZATIONS.	ACCEPTED, DEFECTS NOTED										ACCEPTED, DEFECTS WAIVED.										DISCHARGED, DEFECTS NOT WAIVED.										ACCEPTED, NO DEFECTS NOTED									
	1st Inf	5th Inf	6th Inf	7th Inf	1st F.A.	2nd F.A.	1st Cav	Separate Companies	Unclassified	TOTALS	1st Inf	5th Inf	6th Inf	7th Inf	1st F.A.	2nd F.A.	1st Cav	Separate Companies	Unclassified	TOTALS	1st Inf	5th Inf	6th Inf	7th Inf	1st F.A.	2nd F.A.	1st Cav	Separate Companies	Unclassified	TOTALS	1st Inf	5th Inf	6th Inf	7th Inf	1st F.A.	2nd F.A.	1st Cav	Separate Companies	Unclassified	TOTALS
Strength at date of call.																																								
Number of recruits presented after call.	1757	2307	2148	1424	1419	1294	1211	1965	59	13584	1757	2307	2148	1424	1419	1294	1211	1965	59	13584	1757	2307	2148	1424	1419	1294	1211	1965	59	13584	1757	2307	2148	1424	1419	1294	1211	1965	59	13584
TOTALS.																																								
CAUSES of REJECTION.																																								
Venereal diseases.	8	1	3		1	4	2	11		30	10	18	21	11	21	38	26	19		161	32	23	14	11	15	8	12	17		129										
Under development.			1				2			3												2	1	1	3				2		9										
Under weight.											225	270	238	64	262	231	165	122		1581	35	26	32	8	32	24	15	22		226										
Under height.											2											3									3										
Defective vision.											4	11	15	1	3	1	7	8		48	7	15	10	4	14	12	2	7		71										
Disease of eyes.	23	9	35	7	1	20	16	8		121	1				2	9				12	1	1	1	2	1	1				14										
Deformity of feet.	18	19	104	16	9	79	66	96		408			2	3	1	1				7	1	3	1	3		1				9										
Flat feet.	163	99	171	76	168	146	126	95		1046	14	1	5	4	13		4			40	3	0	11	5	6	2	3	1		39										
Amputation and deformation.				1		6		4		11			2	7		1	10			20		21	0	2	1	5	1	2		40										
Gastro.																							1			1		1		3										
Defective mentality.													2							2		4	3	1			3	1		12										
Diseases of nose and throat.	130	84	181	100	47	134	47	104		787	16	7	1	11	10		4	1		50	15	4	3	1	7	1	3			34										
Veins, arteries and varicosities.	0	3	2	2	3	1		4		13				1						1		4		1			1	2		8										
Hydrocele and varicocele.	170	276	190	113	91	131	96	179		1234		5	3	1	3		1	4		17	4	2	1		3		3	1		14										
Hernia.		3	1		1			2		7	1	6		1	9	2		5		24	20	10	15	5	8	7	6	10		81										
Defective dentition.	1	50	12	3		3	2	10		53	4	3	6			2	1	3		19	2	1			2	2	1	3		11										
Defective hearing.						1				1			1	1		6	3			11	3	5	4	2	2	5	2	1		24										
Overweight and obesity.								1		1	1			1		2	1			5								4		4										
Nervous diseases.			4			1		2		7											1	2	2		1	2				8										
Hemorrhoids.	31	34	42	17	26	17	21	60		338	1	3	2	4			1	2		13	5	3					4	7		19										
Fistulae.																							2		1	1				4										
Heart.			1	1		1	1	1		5	2		1	9			1			13	20	16	14	4	8	9	5	13		89										
Alcohol and drugs.																3				3		3	2							5										
Lungs.	3			3						6		4	1	4		1				10	8	11	8	11	1	1	2	5		47										
Accidental, unclassified.	19	12	15	6	8	6	17	42		125	6		14	8	13	8	3	10		62	17	25	20	3	19	15	5	23		134										
Illiteracy.				1						1												3								3										
TOTALS.	573	600	762	346	365	552	480	609		4207	284	328	299	131	336	302	246	175		2101	181	202	173	71	125	96	68	122		1040	719	1177	914	874	593	342	497	1059	59	6434
REJECTIONS, TOTAL. (Discharged)																					181	202	173	71	125	96	68	122		1040										
PERCENTAGE.	32.6	26.0	35.0	24.3	25.7	41.6	33.0	31.0		30.9	16.1	14.2	13.9	9.2	23.7	23.3	20.3	8.9		15.4	10.3	8.7	8.0	5.0	8.8	7.4	5.6	6.2		7.6	40.9	51.0	42.5	61.5	41.8	26.4	41.0	53.9	100.0	45.9

Surgeon, Medical Dept, U.S.A.

TABLE of MEN EXAMINED.

Department Laboratory, Medical Dept, Camp Mabry, Austin, Texas.

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NATIONAL GUARD, STATE of TEXAS.

RESULTS of PHYSICAL EXAMINATION at MOBILIZATION, UNDER CALL of the PRESIDENT, AUGUST 5th 1917.

ORGANIZATIONS.	1st. DEFECT of IMPORTANCE.										2nd. DEFECT of IMPORTANCE.										3rd. DEFECT of IMPORTANCE.											
	1st. Inf.	5th. Inf.	6th. Inf.	7th. Inf.	1st. F.A.	2nd. F.A.	1st. Cav.	Separate Companies.	Unclassified	TOTALS.	1st. Inf.	5th. Inf.	6th. Inf.	7th. Inf.	1st. F.A.	2nd. F.A.	1st. Cav.	Separate Companies.	Unclassified	TOTALS.	1st. Inf.	5th. Inf.	6th. Inf.	7th. Inf.	1st. F.A.	2nd. F.A.	1st. Cav.	Separate Companies.	Unclassified	TOTALS.	GRAND TOTALS.	PERCENTAGE.
Strength at date of call.																																
Number of recruits presented after call.	1757	2307	2148	1424	1419	1294	1211	1965	59	13584	1757	2307	2148	1424	1419	1294	1211	1965	59	13584	1757	2307	2148	1424	1419	1294	1211	1965	59	13584		
TOTALS.																																
CAUSES of REJECTION.																																
Venereal diseases.	47	41	38	22	37	47	40	47		320	14	8	5	2	14	5	8	24		80											400	4.36
Under development.		1	2	1	3		2	2		12	1				1	1				3										15	0.16
Under weight.	257	306	277	72	294	257	200	144		1807	15	13	15	2	20	9	3	10		87					2					2	1896	20.67
Under height.	2	3								5																					5	0.05
Defective vision.	11	26	23	5	17	13	9	15		119	5	5	6	6	10	8		5		45		1			1					2	166	1.81
Disease of eyes.	28	10	36	16	4	30	18	8		147	4	2	7	1	2	6	4	2		28	3	1			1					5	180	1.96
Deformity of feet.	20	32	107	22	10	81	66	86		424	13	13	43	8	8	37	24	36		182	6	6	2		3	17	6	9		49	655	7.14
Flat feet.	180	108	107	85	186	148	138	96		1113	54	14	40	11	46	73	28	44		312	13	1	3		7	6	5	12		49	1486	16.20
Amputation and deformation		21	10	10	1	12	11	6		71	2	3	3	3	1	1	2			15		1								1	87	0.95
Goitre.			1		1			1		3																					3	0.03
Defective mentality.		4	5	1			3	1		14		2								2											16	0.18
Diseases of nose and throat.	151	65	185	112	64	135	54	105		871	46	32	16	14	27	53	19	16		223	6	2	3		5	6	1	4		27	1123	12.24
Veins, arteries and varicosities.	8	7	2	4	3	1	1	6		32	6	3	2	1	9	2	1	1		25			1		1	1		2		5	62	0.68
Hydrocele and varicocele	162	283	194	114	97	131	100	184		1265	52	41	41	13	35	44	47	43		316	7	4	4	2	11	7	4	7		46	1627	17.74
Hernia.	21	19	16	6	18	9	6	17		112																					112	1.22
Defective dentition.	7	24	18	3	2	9	4	16		83	3	14	2	5	5	3	1	5		38								2		2	123	1.34
Defective hearing.	3	5	5	3	2	12	5	1		36		3		3		1	1			8		1								1	45	0.49
Overweight and obesity.	1			1		2	1	5		10																					10	0.11
Nervous diseases.	1	2	6		1	3		2		15		1				3	1	1		6								1		1	22	0.24
Hemorrhoids	57	100	44	21	36	17	26	69		370	24	29	16	2	22	7	8	27		135	1	3	4	1	7	2	3	7		28	533	5.81
Fistulae.			2		1	1				4	1		2					1		4											8	0.09
Heart.	22	16	16	14	8	10	6	15		107							1			1											108	1.18
Alcohol and drugs		3	2			3				8	1		1							2											10	0.11
Lungs	11	15	9	18	1	2	2	5		63	2		3			1				6											69	0.75
Accidental, unclassified	52	34	49	17	40	29	25	75		321	12	13	5	6	17	4	11	9		177	2		1		1		2	3		9	407	4.44
Illiteracy		3		1						4				1						1											5	0.05
TOTALS.	1038	1130	1234	548	826	951	714	906		7348	257	196	207	78	219	258	159	224		1596	38	20	18	3	39	41	21	47		227	9173	100.00
PERCENTAGE.	58.5	48.5	57.4	34.3	58.6	73.6	59.0	46.1		54.1	14.6	8.5	9.6	5.5	15.4	19.9	13.3	11.4		11.7	2.2	0.9	0.8	0.2	2.7	3.2	1.7	2.4		1.7		

TABLE of DEFECTS FOUND IN MEN EXAMINED.

Maj Exam., Dal
Med Dept, U.S.A.

Department Laboratory,
Sa. Dept's,
Ft San Houston, Texas.

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National Guard, State of Texas.
Results of Physical Examination of 13584 Men at Mobilization, Under Call of the President, August 5th. 1917.

Causes of Rejection.	Number of Men Defective.	Percentage.
Venereal diseases.	320	2.36
Under development.	12	0.09
Under weight.	1807	13.30
Under height.	5	0.04
Defective vision.	119	0.88
Disease of eyes.	147	1.08
Deformity of feet.	424	3.12
Flat feet.	1125	8.28
Amputation and deformation.	71	0.52
Goitre	3	0.02
Defective mentality.	14	0.10
Diseases of nose and throat.	871	6.41
Veins, arteries and varicosities.	32	0.24
Hydrocele and varicocele.	1265	9.31
Hernia.	112	0.82
Defective dentition.	83	0.61
Defective hearing.	36	0.27
Overweight and obesity.	10	0.07
Nervous diseases.	15	0.11
Hemorrhoids.	370	2.73
Fistulae.	4	0.03
Heart.	107	0.79
Alcohol and drugs.	8	0.06
Lungs.	63	0.46
Accidental, unclassified.	321	2.36
Illiteracy.	4	0.03
Totals.	7348	54.09

Sgt. Ericson., Dal.
Med. Dept., USA.

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Ft. Sam Houston, Texas

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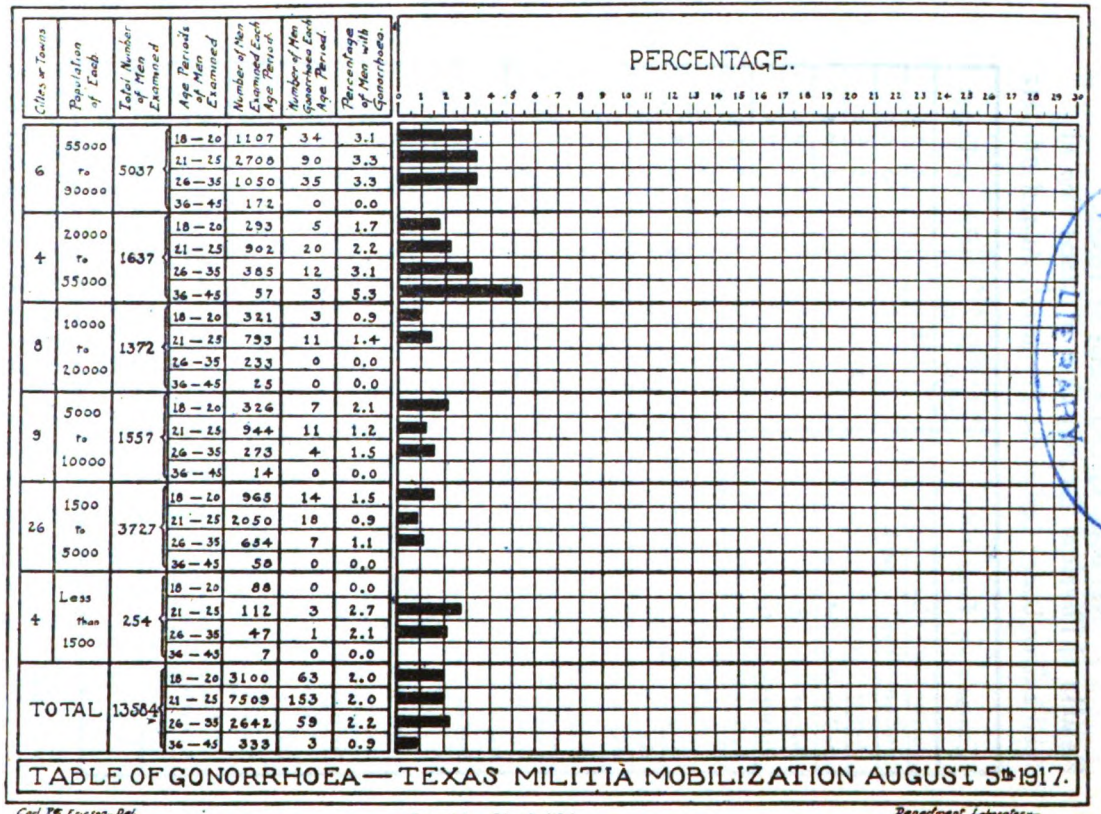

TABLE OF GONORRHOEA — TEXAS MILITIA MOBILIZATION AUGUST 5th 1917.

Carl P.E. Ericson, Dal
Syt Med Dept, U S A

Graphic Chart No 1.

Department Laboratory
Sa. Dept, Ft Sam Houston, Texas

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Cities or Towns	Population of Each	Number of Men Examined	Number of Men Gonorrhoea	Percentage of Men Gonorrhoea
6	25000 to 30000	5037	159	3.2
4	20000 to 25000	1637	40	2.4
8	10000 to 20000	1372	14	1.0
9	5000 to 10000	1557	22	1.4
26	1500 to 5000	3727	39	1.1
4	Less than 1500	254	4	1.6
TOTAL.		13584	270	2.0

TABLE SHOWING GRAND TOTAL OF GONORRHOEA – TEXAS MILITIA MOBILIZATION AUGUST 5th 1917.–

Graphic Chart No 2.

Capt. R.G. Erisman, Pal.
Sgt. Med. Dept. U.S.A.

Department Laboratory
Sa. Dept.
Ft. Sam Houston, Texas.

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seven men, or 30.9 per cent, were accepted who had minor defects not considered of sufficient importance to disqualify the soldier but requiring notation for the protection of the Government. Two thousand one hundred and one men, or 15.4 per cent, were accepted with waiver of defect. Those had defects which the physical standards promulgated by the War Department rate as disqualifying, but which were waived by the district medical examiner or district mustering officer. In these cases the defect was not considered as rendering the particular individual incapacitated for military service. Six thousand two hundred and thirty-six men, or 45.9 per cent, were accepted in whom no defect was noted; 1,040 men, or 7.6 per cent, were discharged because of physical defects.

Discussion of Specific Causes of Rejection

Venereal Diseases.—These to include the following diseases: Gonorrhea, chronic urethritis, syphilis (secondary and tertiary), venereal ulcers (chancres, syphilis primary, chancroids), buboes accompanying venereal infections.

Three hundred and twenty men, or 2.36 per cent, of the entire number of men were found to be suffering from venereal disease as a primary defect; 80 men had venereal disease in addition to other defects. There were 400 cases of venereal diseases, or 4.36 per cent, of all defects noted. One hundred and twenty-nine men were discharged on account of venereal disease. It was thought that information of value might be derived from study of the venereal diseases and the information developed in this study has been charted.

(*a*) *Gonorrhea.* -Graphic Charts 1 and 2 present the information regarding gonorrhea in the Texas Militia. The number of cities and towns in which troops were mobilized were grouped according to population as given by Rand-McNally's Atlas, 1911. The number of men presented for examination from each group of towns was determined according to population. These men were then classified as to age periods and the number of men in each age period having gonorrhea were tabulated and the percentage for the age period recorded in figures and by graphic representation. Chart No. 1 contains this information. It will be seen by reference to this chart that the men suffering with gonorrhea were much more numerous in the larger cities. The disease is more prevalent in the age periods 18 to 20 and 21 to 25 than in the age periods 26 to 35 and 36 to 45. Reference to Graphic Chart No. 2 indicates the greater prevalence of gonorrhea in the larger cities.

(*b*) *Syphilis.*—Graphic Charts 3 and 4 present the information

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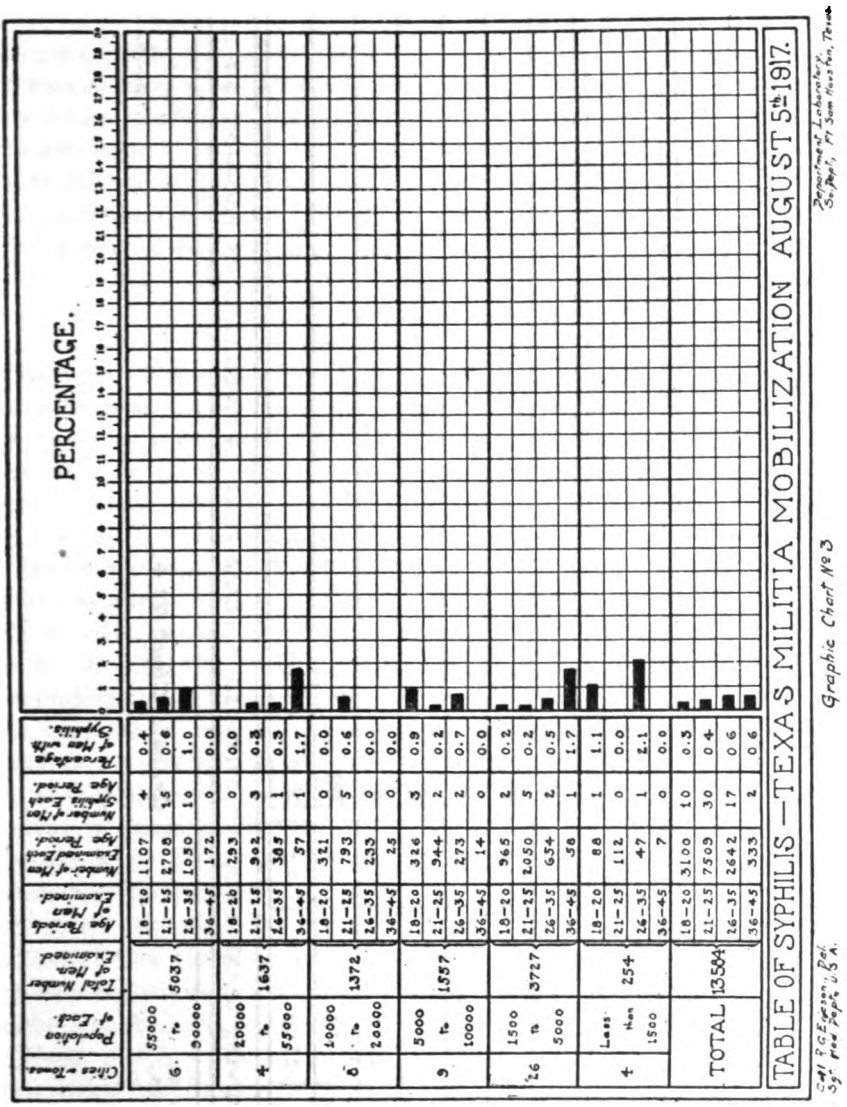
PERCENTAGE.
TABLE OF SYPHILIS — TEXAS MILITIA MOBILIZATION AUGUST 5th 1917.
Graphic Chart No 3
Department Laboratory, San Pedro, Ft Sam Houston, Texas

Cities — Towns	Population of Each.	Total Number of Men Examined.	Age Periods of Men Examined.	Number of Men Examined Each Age Period.	Number of Men Specific Each Age Period.	Percentage of Men with Syphilis.
6	55000 to 30000	5037	18–20	1107	4	0.4
			21–25	2708	15	0.6
			26–35	1030	10	1.0
			36–45	172	0	0.0
4	20000 to 55000	1637	18–20	293	0	0.0
			21–25	902	3	0.3
			26–35	385	1	0.3
			36–45	57	1	1.7
6	10000 to 20000	1372	18–20	321	0	0.0
			21–25	793	5	0.6
			26–35	233	0	0.0
			36–45	25	0	0.0
9	5000 to 10000	1557	18–20	326	3	0.9
			21–25	944	2	0.2
			26–35	273	2	0.7
			36–45	14	0	0.0
26	1500 to 5000	3727	18–20	965	2	0.2
			21–25	2050	5	0.2
			26–35	654	2	0.5
			36–45	58	1	1.7
4	Less than 1500	254	18–20	88	1	1.1
			21–25	112	0	0.0
			26–35	47	1	2.1
			36–45	7	0	0.0
TOTAL		13584	18–20	3100	10	0.3
			21–25	7509	30	0.4
			26–35	2642	17	0.6
			36–45	333	2	0.6

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Cities or Towns	Population of Each	Number of Men Examined	Number of Men Syphilis	Percentage of Men Syphilis
6	55000 to 90000	5037	29	0.6
4	20000 to 55000	1637	5	0.3
8	10000 to 20000	1372	5	0.4
9	5000 to 10000	1557	7	0.4
26	1500 to 5000	3727	11	0.3
4	Less than 1500	254	2	0.8
TOTAL		13584	59	0.4

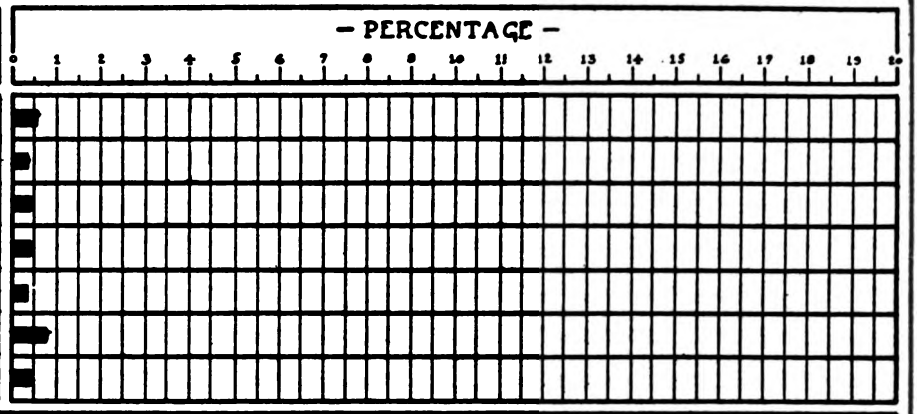

TABLE SHOWING GRAND TOTAL OF SYPHILIS – TEXAS MILITIA MOBILIZATION AUGUST 5th 1917.—

Carl P. G. Ericsson, Pvt. Sgt Med. Dept, U.S.A.

Graphic Chart No 4.

Department Laboratory So. Dept. Ft Sam Houston, Tex.

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relative to syphilis similarly to the presentation of the distribution of gonorrhea in the two charts previously discussed. It is an interesting fact, as shown in these charts, that the men found to have syphilis did not come in greater numbers from the large cities, but the percentage of cases is practically constant in the different groups of men as considered from this standpoint. The prevalence according to age period is reversed for that found in gonorrhea, and for the age periods 26 to 35 and 36 to 45 is nearly twice that for the age periods 18 to 20 and 21 to 25. The cases here presented were not detected through application of the Wassermann test, but were detected by methods of examination previously outlined in this paper. These tables do not present all syphilis present in these men, as experience leads us to realize that application of the Wassermann test to all men examined would disclose a much greater number of syphilitic infections. Other cases which in the reports of the examiners could only be recorded as chancroids undoubtedly would prove positive for primary syphilitic infections if facilities had been available for examination by the dark field microscope. The remaining cases of venereal diseases not tabulated in these charts included ulcers, buboes, etc.

Under-development.—It is a familiar experience in army recruiting offices to encounter large numbers of immature boys who desire to enlist. The present minimum requirements as to age, height and weight are such that men below these standards are incapable of performing the labor required in training, trench digging, and carrying the equipment of a soldier on marches. A soldier meeting the minimum requirements can perform these duties if he is well set up with well-proportioned chest and abdomen. When he is deficient in any of these parts, he is not desirable, especially if he has the elongated or "Hippocratic" chest, slender waist line, or is lacking in muscular development. Men showing asymmetrical development in which the chest is under-developed generally have the "Hippocratic" chest and are mouth-breathers. They are incapable of undergoing military service. The number of men rejected for this cause was nine, while three were accepted.

Under-weight.—This defect exceeded all others in frequency. 1,581 men under the minimum weight allowance were accepted with waiver of defect; 226 men were discharged for this cause. These men represented 13.3 per cent of the entire number of men examined. The condition was noted as a defect of secondary importance in 89 men. 1,896, or 20.67 per cent of all defects, were of this condition. Graphic Charts 5 and 6 present the information obtained in the examination

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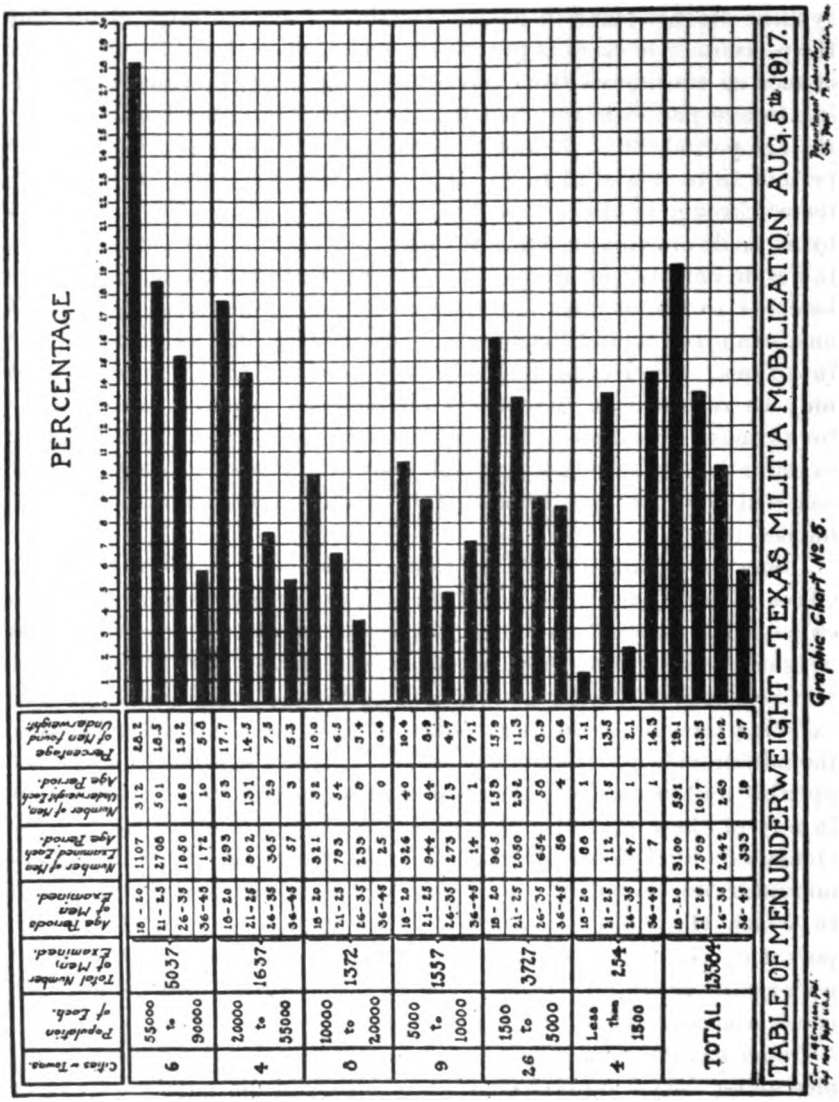

TABLE OF MEN UNDERWEIGHT—TEXAS MILITIA MOBILIZATION AUG. 5th 1917.

Class - Texas.	Population of Each.	Total Number of Men Examined.	Age Periods of Men Examined.	Number of Men Examined Each Age Period.	Number of Men Underweight Each Age Period.	Percentage of Men found Underweight.
6	55000 to 90000	5037	18 - 20	1107	312	28.2
			21 - 25	2708	501	18.5
			26 - 35	1050	160	15.2
			36 - 45	172	10	5.8
4	20000 to 55000	1637	18 - 20	293	53	17.7
			21 - 25	802	131	14.3
			26 - 35	365	29	7.3
			36 - 45	57	3	5.3
8	10000 to 20000	1372	18 - 20	311	32	10.0
			21 - 25	793	54	6.5
			26 - 35	233	8	3.4
			36 - 45	25	0	0.0
9	5000 to 10000	1537	18 - 20	326	40	10.4
			21 - 25	944	84	8.9
			26 - 35	273	13	4.7
			36 - 45	14	1	7.1
26	1500 to 5000	3727	18 - 20	865	135	15.9
			21 - 25	2050	232	11.3
			26 - 35	654	50	8.9
			36 - 45	88	4	0.6
4	Less than 1500	254	18 - 20	86	1	1.1
			21 - 25	112	15	13.5
			26 - 35	47	1	2.1
			36 - 45	7	1	14.3
TOTAL		13564	18 - 20	3100	591	19.1
			21 - 25	7509	1017	13.5
			26 - 35	2442	169	10.2
			36 - 45	333	18	5.7

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Cities or Towns	Population of Each	Number of Men Examined	Number of Men Underweight	Percentage of Men Underweight
6	55000 to 90000	5037	983	19.5
4	20000 to 55000	1637	216	13.2
8	10000 to 20000	1372	94	6.7
9	5000 to 10000	1557	130	8.8
26	1500 to 5000	3727	447	11.9
4	Less than 1500	254	18	7.1
TOTAL		13584	1896	13.9

TABLE SHOWING GRAND TOTAL OF MEN UNDERWEIGHT — TEXAS MILITIA MOBILIZATION AUGUST 5th 1917.—

Carl E. G. Ziegler, Jr.
Sgt. Med. Med. U.S.A.

Graphic Chart No. 6.

Department Laboratory
San. Dept.
Ft. San Houston, Tex.

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in a similar manner to that for gonorrhea and syphilis. Study of these charts shows that the greater percentage of men who are under weight come from the larger cities. The greater percentage of men of the age periods 18 to 20 and 21 to 25 are under-weight than men of the age periods 26 to 35 and 36 to 45. Of the 254 men examined in four towns of less than 1,500 inhabitants, the men of the age periods 18 to 20 and 21 to 25 give a percentage slightly less than those men of the age periods 26 to 35 and 36 to 45. No opportunity is afforded by the records for arriving at an explanation of the causes of underweight. The following may be suggested as causes of this condition: Bad habits: food (insufficient in amount, innutritious constituents), organic disease, intestinal parasites, exposure, unhygienic surroundings, immaturity.

Under-height.—Five men were under the minimum standard of height. The standard of height has been lowered by recent orders from 64 inches to 61 inches. Many men of 61 inches in height are exceedingly well nourished and well proportioned and exceed the minimum requirements for weights and chest development. Men of height less than 61 inches experience difficulty in taking a military stride and may become exhausted in attempting to maintain their places in a marching column. Such men are uniformed with difficulty on account of the relatively small number of such men in the United States. A supply of suitable clothing does not come within the ordinary range of sizes supplied.

Defective Vision.—119 men were reported with conditions of this character as primary defects; 47 men were reported with conditions of this character noted as secondary defects; 71 men were discharged for this condition. The minimum allowances for defective vision are 20/40 for the better eye and 20/100 for the poorer eye when no organic disease exists in either eye. The candidate may be accepted with an error of vision as great as 20/70 right eye in certain non-combatant branches of the service.

Disease of the Eye.—147 men were reported with conditions of this character as primary defects; 33 men were reported with conditions of this character as secondary defects; 14 men were discharged by reason of these defects.

Deformities of Feet.—424 men, or 3.12 per cent were reported with conditions of this character as primary defects; 231 men were reported with conditions of this character as secondary defects; 9 men were discharged by reason of these defects.

Flat Feet.—1,125 men, or 8.28 per cent, were reported with defects of this character as primary defects; 361 men were reported with conditions of this character as secondary defects; 39 men were

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discharged by reason of flat feet. The condition of the feet of a soldier is of the greatest importance. Of the conditions listed as deformities of the feet, all may incapacitate soldiers, especially while marching in campaign. This adds a heavy burden to the medical service, which at that time should be relieved of cases of this class.

Amputation and Deformation.—Seventy-one men were reported with conditions of this class as primary defects; 16 additional men were reported as having conditions of this class as secondary defects; 40 men were discharged by reason of conditions of this character.

Goiter.—Three men were found to have goiter and all were discharged.

Defective Mentality.—Fourteen men were reported as having this defect as of primary importance, and in 2 additional men the defect was noted as secondary importance; 12 men were discharged by reason of this condition.

Diseases of the Nose and Throat.—871 men, or 6.41 per cent, were reported as having conditions of this character as primary defects; in 252 men conditions of this character were reported as of secondary importance; 34 men were discharged by reason of this character of defects.

Veins, Arteries and Varicosities.—Thirty-two men were reported as having conditions of this character as primary defects; 30 men were reported with defects of this character as secondary defects; 8 men were discharged by reason of this class of disability.

Hydrocele and Varicocele.—1,265 men, or 9.31 per cent, were reported as having conditions of this class as primary disabilities; 362 additional men were reported as having conditions of this class as secondary defects; 14 men were discharged by reason of this condition.

Hernia.—112 men were reported with hernia. All were considered primary causes of disability; 81 men were discharged by reason of this defect.

Defective Dentition.—Eighty-three men were reported with this condition as primary defects; 40 men were reported as having these conditions as secondary defects; 11 men were discharged by reason of defective dentition.

Defective Hearing.—Thirty-six men were reported with these conditions as primary defects; 9 men were reported with these conditions as secondary defects; 24 men were discharged by reason of defective hearing.

Overweight and Obesity.—Ten men were reported with these conditions as primary defects; 4 men were discharged by reason of these defects.

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Nervous Diseases.—Fifteen men were reported with these conditions as primary defects; 7 men were reported with these conditions as secondary defects; 8 men were discharged by reason of such disorders.

Hemorrhoids.—370 men, or 2.73 per cent, were reported with these conditions as primary defects; 163 were reported with these conditions as secondary defects; 19 men were discharged by reason of these conditions.

Fistulae.—Four men were reported with this condition as a primary defect; 4 men were reported with this condition as a secondary defect; 4 men were discharged by reason of this condition.

Heart Conditions.—107 men were reported with heart conditions as primary defects; 1 man was reported with a heart condition as a secondary defect; 89 men were discharged by reason of abnormalities of the heart.

Alcohol and Drugs.—Eight men were reported with disability due to these conditions as primary defects; 2 men were reported with disability due to these conditions as secondary defects; 5 men were discharged by reason of these habits.

Lungs, Abnormal Conditions.—Sixty-three men were reported with conditions of this character as primary defects; 6 men were reported with conditions of this character as secondary defects; 47 men were discharged by reason of these defects.

Accidental, Unclassified.—321 men, or 2.36 per cent, were grouped under this heading as primary causes of disability from reports submitted, for the reason that they could not be included in other groups; 186 men were grouped under this heading as having conditions of this character as secondary defects; 134 men were discharged for defects included in this group.

Illiteracy.—Four men were reported with this condition as a primary defect; 1 man was reported with this condition as a secondary defect; 3 men were discharged by reason of this defect.

Summary.—7,348 men were found to have 9,173 physical defects which interfere with their efficiency as soldiers or prevent their serving; 1,040 of these men were discharged. It has been determined by study of the conditions for which these men were discharged, that about 50 per cent of the discharged men might be made capable of performing military service. Men were discharged with disablities which differed only in degree from other men who were accepted. Under each classification of defects noted, the examiners accepted candidates, waived defects, or rejected the men. This examination was conducted under an emergency, and the opinion of the examiner was rendered without opportunity for prolonged observation of

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the individuals. Some examiners had little or no previous military experience upon which to base their judgment. No opportunity is afforded at a time of similar emergency to determine the number of men who harbor intestinal parasites. Military experience of the last two years in southern camps shows these conditions to have a direct influence in the spread of certain epidemic diseases. Unpublished reports of routine examinations made at the Department Laboratory, Southern Department, in men admitted to the base hospital show that about 15 per cent of the patients are hosts of intestinal parasites and hookworm infection is present in about 11 per cent. The patients on whom these examinations were made were in great number from Texas. No opportunity is offered to treat such defects as are remediable, in the present plan of examination, prior to reporting at the training camp. There are, therefore, many men accepted who will fill the hospitals of units training for field service. Many men are relieved of military service who should be treated and made capable of performing military service.

The conditions found as a result of this examination indicate the need of special hospital organization. The objects to be attained by the organization of such hospital facilities are as follows: (1) To prevent such a large number of men being sent to a military training camp with defects which will interfere with their training. (2) To treat many men who under present conditions are rejected for physical defects which vary only in degree from defects in large numbers of men accepted. (3) To drill such men as may be instructed in military drill while undergoing treatment or during convalescence.

Under the present system, these difficulties are unavoidable. A refitting station is proposed as a necessary recruiting unit. All men who are found to be defective should be sent to this institution.

There were reported at this examination 6,236 men, or 45.9 per cent, without physical defects which warranted notation. It is believed that the service would have been benefitted had this number of men, only, of those examined been sent direct to the training camp. It is believed that no men should be discharged as a result of examination conducted as now authorized, but all defectives—in this case 7,348 men, or 53.9 per cent of those examined—should be sent to a refitting station for observation and given the necessary treatment. All discharges should be given from this station after observation or unsuccessful treatment.

The following diagram represents the departments of such a station:

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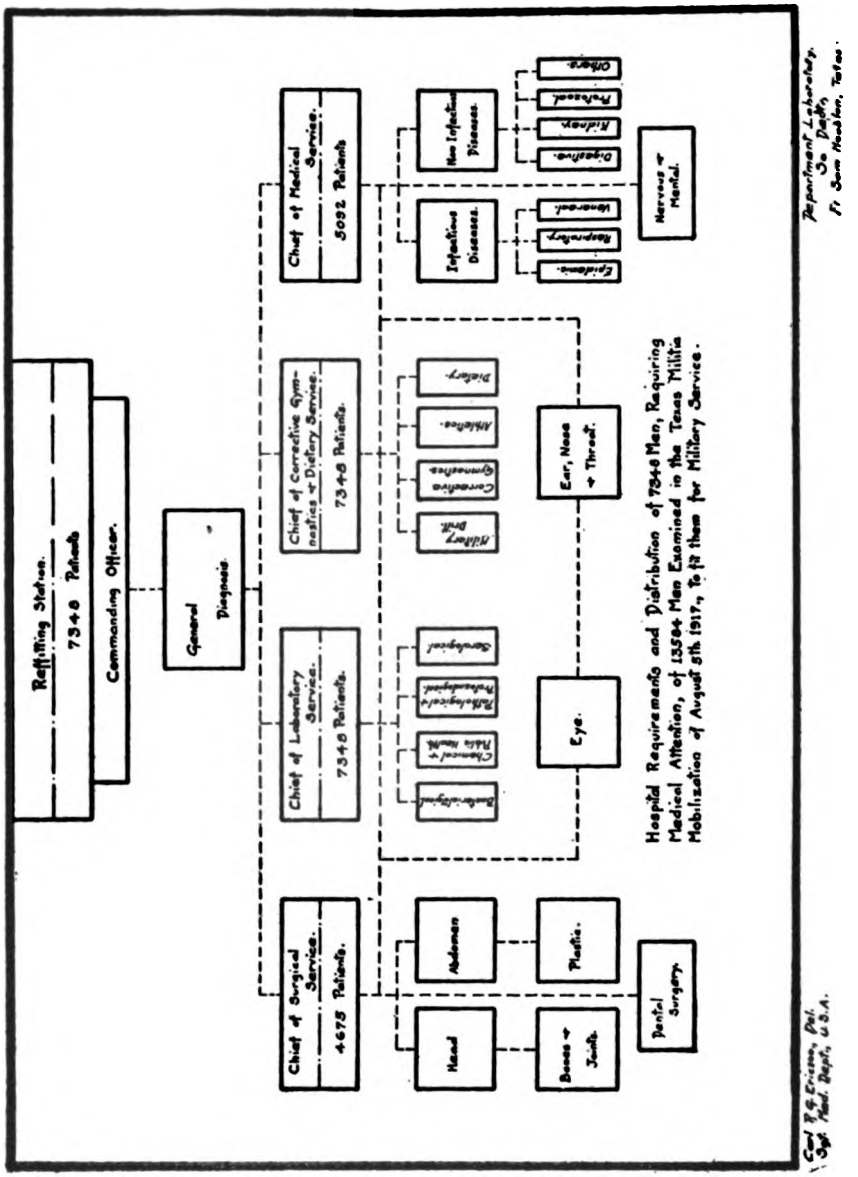

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ARKANSAS TABLE Nº 1.

COMPANIES.	A.	B.	C.	D.	E.	F.	G.	H.	I.	K.	L.	M.	M.G.	M.D.	Sup.	Mgrs.	TOTAL
STRENGHT of DATE of CALL.	74	92	84	66	86	76	81	112	88	92	109	111	68	26	34	80	1281
TOTAL ACCEPTED.	64	71	75	50	78	53	65	81	65	62	66	75	48	21	28	61	963
TOTAL REJECTED.	10	21	9	16	10	23	16	31	23	30	43	36	20	5	6	19	318
NOT CORRECTABLE. See Accompanying Table No. 2.	8	12	6	8	4	8	9	11	13	8	24	26	14	3	5	6	165
CORRECTABLE. See Accompanying Table No. 2.	2	9	3	8	6	15	7	20	10	22	19	10	6	2	1	13	153
PERCENTAGE CORRECTABLE.																	48

RECORD OF PHYSICAL EXAMINATION, OF FIRST ARKANSAS INFANTRY, AT MOBILIZATION UNDER CALL OF THE PRESIDENT, APRIL 6th 1917.

Carl R.G. Ericson, Pvt.
Sgt. Med. Dept, U.S.A.

Department Laboratory,
So. Dept.,
Ft. Sam Houston, Texas.

ARKANSAS TABLE Nº 2.

1st. Ark. Inf.— Rejections: Correctable Defects and Diseases.

Companies.	Over-riding Toes.	Flat-foot.	Hemorrhoids.	Gonorrhoea.	Copperhead.	Obesity	Varicose Veins.	Defective Vision.	Bad Heart.	Insufficient Teeth.	Ingrowing Toe-nails.	Sore or Pain.	Underweight.	Hernia.	Fistula.	Flat Foot.	Totals.
A.		1														1	2
B.		1		4									3			1	9
C.											1		1			1	3
D.				2			1						5				8
E.				3			2						1				6
F.		1		4			1		1	1		2	1			4	15
G.		1					2						1	1	1	1	7
H.			3	3			1						4			9	20
I.				2							1	2	4			1	10
K.			1	2	1	1	2	1	2	1		1	1			9	22
L.		1		4					1	1		2	6			4	19
M.	1	1		1		1	1		1				2			2	10
M.G.				4												2	6
M.D.																2	2
Sup.				1													1
Mgrs.	2	3		3					1	1			3				13
Totals.	3	9	4	33	1	2	10	1	6	4	2	7	32	1	1	37	153

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(Referred to on page 675)

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ARKANSAS TABLE Nº 3.

TABULATION SHOWING CAUSES FOR FINAL REJECTIONS IN MEDICAL EXAMINATION, FIRST ARKANSAS INF.

APRIL 10th to 17th 1917.

Amputation, (recent) finger,	1.
Aneurism,	1.
Arrhythmia,	1.
Arthritis,	1.
Bubo, suppurating,	3.
Cyst (eye) declined operation,	1.
Defective, hearing,	3.
Defective, vision,	16.
Deformity,	6.
Diabetes, mellitus,	1.
Enuresis,	1.
Felony,	5.
Flat foot, (weak)	14.
Fracture, (old)	2.
Gonorrheal rheumatism,	6.
Inmate of hospital, (nervous)	1.
Irritable heart,	1.
Immature,	6.
Mastoiditis,	1.
Mentally deficient,	2.
Mitral murmur,	6.
Orchitis, chronic,	2.
Orchitis, acute,	3.
Otitis, media,	9.
Old injuries,	6.
Paralysis,	1.
Painful cicatrix,	3.
Phymosis, (declined operation)	1.
Stiff fingers,	3.
Stiff elbow, (Adm. Salversan)	1.
Syphilis, secondary,	11.
Deficient teeth,	4.
Trachoma,	1.
Tuberculosis,	5.
Underweight,	17.
Undescended testicles,	1.
Varicocele, marked, (declined operation)	5.
Varicose veins, (extreme) declined operation,	7.
Other conditions,	4.

All of the above enumerated, considered as of sufficient severity to be incorrectable and unfitted for service. TOTAL-165.

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The number of patients, defective, found in this examination are distributed among the four services as the defects were noted in the examination. The 7,348 patients were found to have 9,173 defects. If sent to the proposed refitting station, many men would require threatment in more than one service. In the diagram there have been added to the number of patients for observation of the medical service 15 per cent in addition to recorded medical defects. This number is suggested as the probable number of men who will receive treatment for intestinal parasites. There have also been added to this service 20 per cent of the entire number of men found defective, for the reason that during the period of treatment probably this number of men will require treatment for epidemic diseases.

CONCLUSIONS

1. Practically 50 per cent of all candidates volunteering for military service—20,000 men examined—have physical defects which incapacitate for military service entirely or reduce efficiency.

2. The present method of examination requires acceptance of many defective men or rejection of many men who can be made capable of performing military service.

3. Establishment of refitting stations with properly organized staff for medical treatment and military drill would afford time for observation of men before discharge or afford an opportunity for treatment of curable defects.

4. The number of men available for military service would be increased.

5. The military efficiency of the forces would be increased through bringing all men to a higher physical standard.

6. More efficient intensive training could be given at training camps through reducing the number of men admitted to camp hospitals for physical defects existing at the time of enlistment.

7. Many physical defects exist in young men of military age which could have been corrected, by proper inspection and physical development, while the individuals were school children, if provision had been made for such procedure in our public schools.

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EDITORIAL

THE MEDICAL RESERVE CORPS OF THE U. S. NAVY

The exigencies of the nation have made it necessary to reinforce the medical departments of the Army and Navy with large numbers of civilian medical men, forming a Reserve Corps, as distinguished from the permanent establishments.

Called from an environment where almost complete liberty of individual action prevails, into another where the laws of convention and discipline are paramount, these gentlemen of the reserves are subjected to a sudden change in their mode of living and thinking which is violent and almost revolutionary, a change which requires physical readjustment, as well as mental. The medical corps of the Navy is *sui generis*. The very fact that it is afloat makes this so.

In later years, however, there has been a rapprochement in the duties of the Army and Navy medical services, inasmuch as the Navy, especially the Marine Corps, is so often called to serve on shore; while in the transport service and the hospital ship the Army medical officer is afloat. In times of peace the duties of the medical officer of the Navy on shore and those of the Army medical officer run closely parallel; it is when the naval officer is afloat, and the army officer is afield, that the real contrast in service is evident. A distinguished medical officer of the Army once remarked that "the problems facing the Army Medical Corps were more difficult than those applying to the similar service in the Navy"; and within certain limitations this statement is correct. Whatever betide, it is seldom that Jack is not assured of a hot meal and dry bed, he keeps his commissariat close under his lee quarter, which assets, coupled with a constant supply of pure water and almost autonomous sewage disposal, are the greatest factors in the generally excellent health of the naval force, to which the report of the Surgeon General attests; indeed the ship's company is in the most up-to-date isolation ward. On the other hand, the situation in the army is in marked contrast, especially as war has assumed its characteristics of today. To keep a force serving in wet and muddy trenches, and sleeping in dugouts, in a state of military efficiency is the most serious problem ever faced by sanitary officers in the theater of war, and the manner in which this great task is being successfully accomplished is the most remarkable in the study of military medicine. The work involved requires not only the highest ability, but the most unremitting toil.

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The medical officer ordered to a ship of war finds an environment that is absolutely novel, inasmuch as in topography no two ships are alike. With the excellent equipment provided the medical department today, with the regular evacuation of the most seriously invalided, either to hospital or hospital ship, the service problem is simple, as a rule; but when the real business of war is reached, no proposition is more complex than the care of the wounded in sustained naval engagements. Unlike the ordered army system of front, communications and base, the naval medical department is emphatically between "the devil and the deep blue sea"; the choice of shelter for the wounded, *points d'arbri* (where no such thing exists); the transportation up and down perpendicular ladders and down the tops; medical and surgical procedure always under fire and amid din and confusion to which no other battle ground can compare, with the entire medical department at sea, on the firing line. In situations where gun fire is concentrated, such as occurred in the battle of the Sea of Japan, or that more recently off Jutland, chaos reigns and little can even be attempted.

The medical department of the Navy has been revolutionized in the past thirty years, a fact due to three principal causes: (1) the construction and maintenance by the United States of a large modern fleet; (2) the enlarged sphere of influence whereby the United States became a world power; (3) the inauguration of the Naval Medical School for the special study of naval medicine.

The first of these propositions is too broad for present consideration; the second embraces all that possession of tropical territory, with its occupation by the fleet and the army, involves; the third means an immense advance on the intellectual and professional side, whereby a class of officers is prepared for the assumption of more important duties demanding greater technical ability and a standard of higher scientific value.

As far as possible, it has been the aim of the course at the Naval Medical School to meet the new conditions imposed upon the corps, and when we consider the aspects of modern warfare, the necessity of this equipment is self-evident. The means of maintaining physical efficiency in the submarine service, the physico-vital problems of aviation, and many others of great importance made this requisite.

If the medical schools of the Army and the Navy are to achieve their full measure of usefulness, it must be realized that the courses should be longer, more technical, even if some purely medical branch,

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a knowledge of which the candidate should be possessed when he entered school, is sacrificed. When we consider the vast import of physical and chemical agencies in modern war, the schools, to be efficient, must include instruction in these subjects in their curricula, for the average medical man is, as a rule, little informed in the branches of exact science.

The members of the medical corps of the Army and Navy and Public Health Service, regular and reserve, are first of all physicians, and, in general, their abilities in their respective spheres are more often the result of experience than any other factor, and herein is the greater value of the trained medical officer. All of which is equivalent to saying that the trained physician in the service, the medical officer, has become more the sanitarian and less the doctor; more absorbed in the general than in the particular, and that the life and limb of the individual, while of great importance, are secondary to measures *pro bono publico*.

A lesson that cannot be too early or well learned by all officers is that we are but coöperators in an establishment whose primal object is one of destruction, and one in which the consideration of human life often becomes quite secondary. Therefore it follows that, at times, the wisest and most humane recommendations of the medical department may, because of military necessity, be disapproved. The reserve officer being, as it were, on a temporary status and with another point of view, may not apply himself to the more serious tasks, and only become interested in those promising immediate professional return; but he may rest assured that at no time in the history of the service has the opportunity and promise of reward for intelligent observation and industry been brighter or their need greater.

Aside from the direct benefits which the patriotic reserves generally will render, there can be no doubt that the labors of these specially able and scientific officers, whose names, illustrious in the national professional body we see on the rosters, will not fail to make a marked impression on the military medical services to which they are attached, tending greatly to the scientific and professional betterment of the corps.

JOHN C. WISE.

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THE MEDICAL INSPECTOR

Experience in every walk of life teaches that inspection is essential to efficiency. Every housekeeper knows this, and it is the daily routine of all good ones to inspect their houses. Especially is inspection necessary in armies, for the life of the soldier in the field tends towards carelessness, and it is only through infinite care in details that an army is kept up to a high state of efficiency.

The Medical Department is no exception to this rule, and all our wars have demonstrated that a specially designated class of officers, known as medical or sanitary inspectors, is essential to the proper management of the medical department. The designation "Medical Inspector" was used during the Civil War, but in our modern plan of organization "Sanitary Inspector" was substituted as being more definite and up-to-date. The value of this change in title is questionable, as "medical" is all-inclusive, while "sanitary" is special.

It appears that matters had reached such a pass in 1862 that Congress found it necessary to enact a law directing the organization of the Medical Inspectors' Department under the Surgeon General of the Army, in words as follows:

There shall be one Medical Inspector General of Hospitals . . . with the rank, pay and emolument of a colonel of cavalry, and the Medical Inspector General shall have, under direction of the Surgeon General, the supervision of all that relates to the sanitary condition of the Army, whether in transports, quarters, camps, and of the hygiene, police, discipline and efficiency of field and general hospitals, under such regulations as may hereafter be established.

That there shall be eight medical inspectors with the rank, pay and emolument, each, of a lieutenant colonel of cavalry, and who shall be charged with the duty of inspecting the sanitary condition of transports, quarters and camps, of field and general hospitals, and who shall report to the Medical Inspector General, under such regulations as may be hereafter established, all circumstances relating to the sanitary conditions and wants of troops and of hospitals, and to the skill and efficiency and good conduct of the officers and attendants connected with the medical department. . . . That whenever the Inspector General, or any one of the medical inspectors, shall report an officer of the Medical Corps as disqualified by age or otherwise for promotion to a higher grade, or unfitted for the performance of his professional duties, he shall be reported by the Surgeon General, for examination, to a Medical Board . . .

A subsequent law approved May 14, 1862, reads:

That the Medical Inspector General or any medical inspector is hereby authorized and empowered to discharge from the service of the

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United States, any soldier or enlisted man, with the consent of such soldier or enlisted man, in the permanent hospitals, laboring under any physical disability which makes it disadvantageous to the service that he be retained therein.

On December 22, 1862, there were added to the Medical Corps eight medical inspectors appointed for their fitness, without regard to rank and—

that the officers of the Medical Inspector's Department shall be charged, in addition to the duties assigned to them by existing law, with the duty of making regular and frequent inspections of all military general hospitals and convalescent camps and shall, on each such inspection, designate to the surgeon in charge of such hospitals or camps all soldiers who may be, in their opinion, fit subjects for discharge from the service on surgeon's certificate of disability, or sufficiently recovered to be returned to their regiments for duty, and shall see that such soldiers are discharged or so returned, and the medical inspectors are hereby empowered, under such regulations as may be hereafter established, to direct the return to duty or the discharge from service, as the case may be, of all soldiers designated by them.

This in brief is the legislative history of the Medical Inspector's Department. It was born in dire necessity, it performed its functions satisfactorily, and it ceased to exist, like many other good things dearly bought through suffering, with the close of the Civil War, leaving the conviction that it contained the germ of good administration, needing development to produce the highest fruition. The Medical Department endeavored to perpetuate it, but in the days of small things this was denied.

From these laws one observes that the sphere of inquiry of this department extended widely, was indeed all-embracing and largely executive, for the inspectors were empowered to do things. While, of course, it did not touch purely military questions as such, it was certainly related to them, for the condition of the man behind the gun is vital in such questions.

Since the Civil War the Medical Department has greatly developed in many ways, but its most pronounced development lies in the taking over of its entire personnel, particularly the Medical Department enlisted force, which before then was only borrowed from the line. It is now an army within itself, with all that such implies, and demands the closest kind of inspection by those thoroughly familiar with its working.

Thus far we have not organized a Medical Inspector General's department, with the well-defined authority of that of 1862-65. Of course we shall need it as the war progresses, and it would be well

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that the Commander-in-Chief should authorize us to organize such a department now. We have a nucleus, for some of our most experienced medical officers, detailed in the office of the Surgeon General of the Army, assisted by the division sanitary inspectors, are keeping the office in close touch with the sanitary and medico-military conditions throughout the army. But this organization is not closely knit and has not the authority of the medical inspectors of the Civil War, which it should have.

We are, to be sure, fortunate in having within the Medical Department a new feature, a Sanitary Corps, made up of specialists whose chief functions are investigative, instructional and executive in the correction of sanitary faults, chiefly of conservency. The members of this corps, many of them accomplished specialists, among other things visit the various camps to help correct the sanitary faults that may exist there. As a matter of fact this corps in its inception was essentially a field formation, the idea of which we borrowed from the British, in which army it is divided into sanitary sections originally attached as divisional troops, but laterally as part of an army corps. The chief of a sanitary section in the British service, a medical officer when one is available, is the inspecting and advisory authority in regard to sanitation carried on by sanitary sections in the trenches and areas where stationed. But these officers are in no sense medical inspectors general, the necessity for which existed during the Civil War, and who are equally necessary in this war.

The corps of medical inspectors should be organized from our most accomplished and experienced medical officers, men thoroughly familiar with the multifarious duties of the Medical Department, whose judgment has been ripened by reasonably long service, who have adequate rank, who are familiar with the requirements and customs of the army, and whose recommendations would receive the consideration that such knowledge and status justify.

That the work of this department might be made efficient, there should be a proper geographical organization of the Medical Inspector's Corps, with defined inspection districts embracing various formations and aggregating a certain military population. These districts should be as largely autonomous in their work as circumstances would permit, and thus relieve the Surgeon General's Office of much detail that now clutters the wheels of progress. It is to be hoped that such an organization will soon be effected and that our Medical Inspector's Corps will prove to be as efficient as it is necessary.

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THE FLYING TEMPERAMENT

The importance which has been assigned to our aviation corps has focused upon it the attention of our own Government and that of the Allies. The latter appreciate this more keenly than we ourselves, since foreign artillery officers unite in expressing the opinion that the conquerors of the air will be the chief factors in winning the war. It seems incredible that we should have neglected so long aeronautics and pursued it rather as a sport than as a serious business, in view of the fact not only that it originated with us, but that such strenuous efforts have been made by its supporters to arouse the interest of Congress in a science that has revolutionized modern warfare.

But this is only another example of the unpreparedness for which we have paid dearly and will pay more, it may be with disaster to our arms, until we retrieve our wasted time. Thoughtful observers of our tardy and feverish efforts to render efficient aid to our allies are agreed that our most valuable assistance will be in the direction of aviation. Here we can supply numbers, as well as trained fighters, with the material (men, if not machines) at our command.

Aviation is the most attractive sporting proposition to our high-spirited youth, by whom the risks are not weighed in the same scales with the excitement, independent action and the rewards of personal bravery. They form unquestionably the *corps d'elite,* these aerial warriors, the cream of the service. No one, even the graybeard who still cherishes the flickering flame of youthful enthusiasm, can fail to catch their adventurous spirit if he is long in their company. They still retain much of the chivalry which is elsewhere absent in this savage, primeval war, and recall the days of knighthood now represented only by the hand-to-hand combats, more suggestive of the Stone Age than of the time when "Knights were bold," though helmet and breastplate have been retained.

The aviator is a picked man. Like the Arctic explorer, he must be young and strong, sound in mind and body and with a natural fearlessness, inherent and not cultivated. Youth is the one important factor. Many of the most successful fliers are under twenty—all should be under thirty, or at the most thirty-five. They all bear the same hall-mark—contempt of danger, reckless courage, combined with coolness and initiative. Perfection in technique is of course necessary, but combined with it there must be experience, good judgment, resourcefulness in emergencies—in fact the same quali-

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ties that make the successful surgeon—and all these the possessor must have at the beginning of his career, or it will be brief and the end inevitable.

"One crowded hour of glorious life
Is worth an age without a name."

When the poet sang he could not have imagined how often this sentiment would be verified, not only by the successful explorer, or climber of a mountain peak hitherto unattained, but in the daily experience of the flying man.

No wonder that the battle in the air is so fascinating that it possesses for him far more attractions than the struggle in another world than his. Danger is only an added charm, the thought of instant death far less repulsive than the possibility of lingering on for years, crippled and mutilated, an object of pity and sympathy, for which decorations, pensions, the applause of men, are only a present, not a future, compensation.

If there is one thing more than another that makes an older man regret his vanished youth at this time it is the thought that he can never be a hero of the air—in fact any kind of a hero, except behind a desk, or in the operating room. *Mais, chacun a son gout.* Doubtless many old chaps do not see any attraction in it, even if they had a chance to try it.

To return to the prosaic. Aviation possesses a peculiar interest for the medical officer, on whom alone depends the selection of the candidate for the corps. Obviously only an expert in the eye and ear is competent to apply thoroughly and scientifically the service test demanded. We are especially fortunate in having a number of specialists, not only in the Medical Reserve Corps, but a few in the regular corps, fully qualified for this work, and no other medical man should attempt it.

But even when a young fellow has been pronounced physically perfect, and his mental equilibrium has been tested so far as it is possible by the methods now employed, there still remains an uncertain factor. He may be reckless and daring, apparently without "nerves" (the plural has a different significance from the singular), yet the question always arises: "Will he last?" Over here we often hear the expression "flying temperament," which is difficult to define. A surgeon's or a company commander's temperament is an important asset; far more important is that of the youth who is daily exposed to the most severe strain of all!

While at a medical conference at the central recruiting office in

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England for aviators, at which there was an exhaustive discussion of physical tests, I was surprised to note how little stress was laid on the psychological element. It was admitted that even the most experienced examiner could not predict how a flier would behave in action, or whether he would cease to be useful after he had met with an accident, or had had a narrow escape from death. Naturally, if his nerve is once gone, his career in the air is at an end. There is no way of ascertaining this vital fact except by constant daily observation of the aviator after he has begun to "use his own wings," especially in action.

Provision has been made in our service for observation along this line by detailing a medical officer to each flying camp, whose sole duty it will be to study the flying temperament as it is affected under all conditions. This is a new departure and will elicit many new facts, both physical and psychological. We have such a wealth of good material that we can afford to apply more rigid tests than our allies and to accept only the best.

The halo of romance surrounds the gallant hero of the air, but the man of science must consider him from a different viewpoint and sternly reject the most promising candidate who has been tried and found deficient in the mentality that is not discoverable by ordinary physical tests.

H. C. Coe.

THE PASSING OF THE GENERAL STAFF

Those who have read the epochal report of General Upton on The Military Policy of the United States could not be surprised that so wise a man as Elihu Root, then Secretary of War, after studying that report, should have determined upon a radical reorganization of the administrative end of the Army.

The necessity for such reorganization was quite apparent; our military administration was hopelessly archaic, and our military machine, except for the quality of its elements, hopelessly bad. We had learned nothing in a military way during our existence as a nation except by hard knocks, and when the hurt of the knock had passed we straightway forgot the reason thereof.

It is, then, not to be wondered at that when a man of vision became Secretary of War he would seek a remedy for our military defects, and what more natural in the seeking than he should study the methods of other armies of recognized excellence.

In all such armies he found what we wholly lacked—an organiza-

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tion to concentrate the best brains, experience, and aptitude in the head of the body military, and use it to direct all the members, rather than have each member directed independently by its own little brain.

General Crozier, we believe, drew up a memorandum in 1900, suggesting and outlining a general staff, which was submitted to the criticism of the general officers of the Army, and finally took shape in a report formulated by General Carter under direction of Mr. Root, which was ultimately enacted into law in 1902. Thus was born the General Staff of the United States Army.

The functions of the General Staff, as laid down in the law, are well known:

> To prepare plans for the national defense and for mobilization of the military forces in time of war; to investigate and report upon all questions affecting the efficiency of the Army and its state of preparation for military operation; . . . to act as agent in informing and coördinating the action of the different officers who are by law under the supervision of the Chief of Staff," etc., etc.

All very important, indeed vital, to the efficiency of the Army. If such a body did not exist by law, it would have to be improvised, as it had heretofore been with us, after the act of war.

Of course, it was not to be expected that such an organization would spring into existence as did Minerva, "full armed from the brain of Jove." It had in its infancy the troubles consequent thereto, but it progressed to sturdy boyhood, notwithstanding these, and it really made a decided impression upon the service; but now, in the first flush of youth, it is threatened with dissolution as a military body.

We learn from a current publication

> there was some surprise expressed recently when it was made known that medical reservists would be assigned to duty with the General Staff, instead of officers of the regular establishment who would naturally be in a better position to discuss policies involving medical department affairs and administration, in the general staff discussions, than officers of the Reserve Corps who, however distinguished in the medical and surgical profession, could not be expected to have as complete and useful knowledge of the situation.

The gentlemen selected are two of the most distinguished physicians in the world, to be associated with whom would be an honor to any organization; their reputation in their special practice is second to none and the value of their advice therein could not be

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questioned. They are, however, without experience in those functions which the law prescribes as pertaining to the General Staff.

It would appear that this latter fact was recognized by the General Staff, for when these gentlemen, or one of them, reported for duty in accordance with orders, as we are informed by the public press, they were told that "their presence would not be required with the General Staff except on occasions when advice was needed," presumably in case of the illness of their fellow-members.

Some might infer from this that the General Staff is ignorant of the fact that there are stupendous medico-military problems connected with war, requiring the advice and experience of experts who had devoted their lives to the study of such; but this is not our inference. It would appear to us rather that the authorities had determined our soldiers were to be sent to the fighting line, where of course they would prefer to be, and the General Staff turned over to those civilians who have demonstrated themselves to be, in their various callings, as Mr. Lincoln expressed it, "the natural leaders of men."

THE 27TH ANNUAL MEETING OF THE ASSOCIATION

The selection of Camp Greenleaf, on the historic battlefield of Chickamauga, as the place of our twenty-seventh annual meeting, is a happy augury of the greatest assemblage the Association has yet had.

At the geographical center of many camps, the Medical Officers Training Camp at Oglethorpe affords in every way the ideal location for the assembling of medical officers, who are members of the Association.

Then, too, the wonderful facilities the camp itself affords for such a meeting. Every form of medico-military activity is there in actual operation; thousands of medical officers are undergoing instruction, and everything that medical and surgical experience in warfare has approved there receives daily demonstration.

While the hospitality of Camp Greenleaf will undoubtedly be extended to our members, who will thus be afforded an opportunity to enjoy a taste of the real soldier life, those who might prefer a more conventional existence, would find ample and excellent accommodation at the Hotel Chattanooga, forty minutes distant from Fort Oglethorpe, the station for Camp Greenleaf.

The meeting will be held Monday, Tuesday and Wednesday October 14, 15 and 16, 1918, and no member, whose presence is possible, could afford to miss so interesting an occasion.

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ASSOCIATION NOTES

A meeting of the Executive Council of The Association of Military Surgeons, U. S., was held in Washington, D. C., June 10, 1918.

Accepting the suggestion of Col. E. L. Munson, M. C., U. S. A., commanding the Medical Officers' Training Camp there, the Council voted to hold the next annual meeting at Camp Greenleaf, Fort Oglethorpe (Chickamauga), Ga., October 14, 15 and 16, 1918.

The following named 213 medical officers, who have complied with the requirements of the constitution, were duly elected members of the Association:

Medical Reserve Corps, U. S. Army

Majors

William Thos. Coughlin
Fred Fletcher
Donald Jackson Frick
Alfred Friedlander
Thomas B. Henry
Hanau Wolf Loeb
Charles G. Lucas
Cyrus W. Strickler
Harry T. Summersgill

Captains

Lewis C. Babcock
Joseph H. Barach
Arthur H. Beebe
Horace D. Bellis
John P. Bland
Horace Keith Boutwell
Samuel A. Buchenholz
James B. Bullitt
Josiah T. Bunting
Henry W. Cattell
Edward H. Clark
Mark Allen Gier
Alfred G. Hearn
James Walter Heustis
James A. Hill
Elmer E. Holt
James A. Hull
Nathaniel M. Jones
A. I. Lownthal
Denis A. McAuliffe

Captains—Continued

William J. Merrill
Daniel L. Mohn
Arthur E. Owen
Charles H. Parker
George H. Putney
Hiram P. H. Robinson
Hugh S. Rowlett
Benj. F. Scaiefe
Ralph J. Sewall
Henry H. Slater
Richard Penn Smith
Leonard S. Steadman
William Gray Thigpen
Roy Eccles Thomas
Francis A. Thompson
John Wesley Tippie
Gregory A. Wall
Walter Webb
Christian H. Zoller

First Lieutenants

Alfred George Allen
Louis M. Alofsin
Joseph Aspel
Walter J. Baker
David W. Beard
Archie Bee
Frederick N. Bigelow
Benjamin F. Bowers
Bruce H. Brown
John Collinson
George F. Cooper
Leslie E. Daugherty
William L. Denton

First Lieutenants—Cont'd

James R. Dickson
Fredk. J. J. Dillemuth
Edmund L. Douglass
Charles B. Drake
Louis S. Dunn
William B. Ebeling
Benj. B. Finkelstone
Tucker Young Fleming
Oliver J. Flint
Clarence W. Frey
Isaac J. Frisch
Lowell C. Frost
Rhea E. Garrett
Samuel Goodglick
Jacob B. Hesterly
Rezin P. Johnson
Joseph R. Jones
John L. Kantor
John F. Kenney
Cleve E. Kindall
Henry G. Lampe
Ertie C. Lanter
John C. Lawson
Samuel B. Locker
Ralph Lovelady
John F. Lutz
H. R. Mann
Bernard C. Marantz
Ofard Francis May
Daniel F. McCann
Bernard J. McCormick
George McKenzie
Francis D. McNertney

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First Lieutenants—Cont'd.

Benjamin H. Minchew
Michel F. Morvant
Manuel F. Nater
William B. Newlon
Homer L. Nickell
Dean H. Osborn
Samuel E. Peden
Franklin P. Phillips
Henry L. Picard
Monte C. Piper
George F. Pope
Stephen H. Ragan
Stanley P. Reimann
Max Sehan
Jacob E. Shearer
William L. Sherman
Harold C. Tooker
Frank C. Totten
John DcC. Verrilli
Victor D. Washburn
Harry E. Whaley
Solon C. Whinery
Charles B. Yost
Joseph J. Zimmermann

Medical Corps, U. S. Navy

Surgeon

Norman Thos. McLean

P. A. Surgeons

Arthur E. Beddoe
Alex. B. Hayward
John B. Pollard
Charles S. Stephenson

Assistant Surgeons

Foster H. Bowman
Thomas P. Brennan
John Howard Chambers
Sterling S. Cook
James E. Harvey
Robert N. Hedges
Roy J. Hefferman
George N. Herring
Silas B. Hull
G. G. Irwin

Assistant Surgeons—Cont'd

Alvin E. Kuhlmann
Esdras J. Lanois
Wm. S. Leavenworth
James E. Lebensohn
Joseph E. Malcomson
John R. Middlebrooks
Milo K. Miller
Julius F. Neuberger
John R. Poppen
James D. Rives
Lawrence James Butka
E. Arthur Stephens
Robert S. G. Welch

Medical Corps, U.S.N.R.F.

Surgeons

Porter B. Brockway
Judson Daland
James T. Hanan
Clifford E. Henry
Joseph H. Hines
John A. McGlinn
Charles W. Moots
Zachary T. Scott
Frederick O. Williams

P. A. Surgeons

Emmett D. Angell
Harris M. Carey
John W. Daugherty
John W. Davis
E. W. Gould
Arthur M. Hauer
Homer A. Higgins
John F. McCullough
Andrew Minaker
Arthur H. Richardson
W. S. Thomas
Harrison S. Thurston
Julius L. Waterman

Assistant Surgeons

G. S. Allyn
Lewis G. Avery
James L. Ballou
Henry W. Benjamin

Assistant Surgeons—Cont'd

Enoch Callaway
James F. Churchill
Samuel W. Connor
Alfred A. de Yoanna
Jonathan Forman
William B. Giles
John P. Gilmer
Irving Gray
Albert J. A. Hamilton
Byron M. Harman
John B. Healy
Walter E. Hennerich
Frank A. Hughes
Westley M. Hunt
A. C. La Bine
Jules Magnette, Jr.
Royal A. McCune
Edward L. McDermott
Chester F. McGill
Walker J. Mullenhagen
Malcolm T. Munkittrick
M. C. Myerson
H. J. Noble
Bernard J. O'Neill
Philip J. Reel
George W. Ruger
Worthington S. Russell
Max Shaweker
John G. Smith
Solomon Schneider
Albert W. Stearns
Barton K. Thomas
Paul R. Thomas
William J. Walsh
Theodore B. Warner
Joseph T. White
Robert V. Williams
Robert S. Wood
Paden E. Woodruff

Medical Corps, N.G., U.S.

Major

William S. Lawrence

First Lieutenant

Frederick G. Speidel

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COMMENT AND CRITICISM

THE NEW STATE TROOPS—

With the absorption into the armies of the United States of the Organized Militia it at once became apparent that some sort of a state military organization, as a substitute for the National Guard, was necessary for many reasons and much progress has been made in this direction. THE MILITARY SURGEON is indebted to Maj. Maurice L. Blatt for the following:

MEDICAL SURVEY OF AN ILLINOIS RESERVE MILITIA REGIMENT, WITH A PRACTICAL METHOD OF CLASSIFICATION

The President's orders withdrew the militia from state control in June, 1917. This left states in which there was no constabulary entirely without military forces. The situation and its dangers were realized immediately by the citizens of Illinois, and especially in the industrial centers, such as Chicago, where a large population has not been entirely assimilated.

Looking forward to the possibility of industrial and civic unrest which not infrequently follows so drastic a change as our Government was authorizing in entering the war, and at the same time invoking the draft, patriotic and civic-spirited men, employed or residing in Chicago, organized companies and started drilling. The men were simply organized into provisional companies by captains from the neighborhood.

With the idea of enlarging their field, the Committee on Military Affairs of the State Council of Defense began to number and assume control of these units as Illinois Volunteer Training Corps, and on July 1, 1917, the Buck bill was passed authorizing seven regiments of reserve militia. Four of these seven regiments were allotted to Cook County.

As soon as these regiments were organized, the staff officers were appointed and the medical department organized, as a brigade unit. Meetings of the medical officers are held monthly and matters of importance are decided, so that the medical officers of the brigade constitute a unit, with an acting brigade surgeon.

Before mustering these training corps troops into the Reserve Militia, each organization was examined physically for heart lesions, hernias and other easily apparent physical disabilities. No record was kept of this examination, however, as at that time it was felt that full companies of active men were more essential to the safety of the community than the weeding out of the comparatively unfit.

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By January of this year, however, the regiments were so well organized that physical examination with the purpose of eliminating the unfit was possible. Furthermore, many new men had been enlisted in the interim. At a meeting of the brigade medical officers, it was decided that for our purpose it would be advisable to classify the men in some manner more satisfactory than simply rejection or acceptance. With this idea in mind, a reëxamination was instituted. The following tables show the class of men constituting the Second Regiment, of which the author is the surgeon, and the defects present in individuals accepted or rejected.

TABLE I

	Under 18	18–25	25–30	30–35	35–40	40–45	Above 45
Class A	5	185	104	87	37	39	12
Class B	4	62	48	42	37	47	29
Class C		12	11	11	12	10	18
Class D	2	15	15	8	5	9	14

TABLE II

	Class B	*Class C*	*Class D*
Slight hemorrhoids	5	1	2
Above 40	61	22	17
Slight flat feet	71	11	3
Vision below 20/40	76	18	4
More than one disqualification	66	36	32
Inguinal rings	34	8	6
Functional heart lesion	12	4	1
Teeth poor	20	9	4
Vision below 80/100	14	18	11
Hernia	1	0	21
Under 18	6	2	1
Defective hearing, one ear	8	6	5
Enlarged thyroid	0	1	0
Deformity not interfering	20	7	5
Marked flat feet	0	3	75
Epilepsy	0	0	2
Hydrocele	2	0	0
Nasal obstruction, slight	1	0	0
Varicose veins	0	2	1
Overweight	3	1	0
Valvular heart lesion	1	0	9
Underweight	1	1	0
Nervous diseases	0	0	3

Table I is arranged in approximately five-year age groups, under headings A, B, C and D. Table II shows the defects found in men classified as B, C, and D.

Under Class A, individuals are placed who show no defects which in any way detract from their military ability. If defects are present they are of minor character, as slight varicoceles, very slightly defective vision, etc.

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Class B includes men who have minor defects not in any way incapacitating them for military duties, but nevertheless defects which might, with prolonged campaigning, lead to difficulty. With this idea, age above forty has been considered in itself a defect, and any individual who has passed his fortieth year, showing even minor defects, has therefore been placed in Class B. The only individuals above this age not so placed are those showing absolutely no defects of any type.

Class C includes men who are acceptable but not desirable, and in communicating their names to the commanding officer of the company, he is informed that the mere grading of such men "C" is a suggestion to him that they be gotten rid of before the organization takes active service, unless such a man shows unusual qualifications along some particularly useful line. This class allows the company commander to keep in service men with flat feet or markedly defective vision or hearing, or who are over age, if their usefulness as buglers, stenographers, clerks, chauffeurs, or mechanicians is such that their services are of unusual value.

Class D includes men who are disqualified for the service, because of physical defects of so grave a nature that, no matter what particularly useful qualifications they might have, they would be unacceptable. In this class men are included with hernias, with vision below 20/100 uncorrected, with incapacitating nervous diseases, and with demonstrable valvular heart lesion, marked flat feet, etc.

NOTHING NEW UNDER THE SUN

THE MILITARY SURGEON is indebted to Col. F. R. Keefer, M. C., U. S. Army, for the following valuable comment:

Army medical officers of wide experience and reading thought, at the outset of our participation in the world war, that the special diseases which were apt to afflict armies in campaign had been largely conquered, and that, therefore, our soldiers would suffer but moderately from transmissible diseases. While this comfortable presumption has held true with respect to those affections which army sanitarians had learned to regard as scourges especially be to dreaded—namely, typhoid fever and allied intestinal infections—other types of disease formerly thought to be of comparatively little moment have, somewhat unexpectedly, replaced the former as important factors in the production of high non-effective and death rates. Among the latter are scarlet fever, meningitis, and diphtheria.

But the disease which, more than others, has held the attention of the many who encountered it during the winter just past, has been a peculiar and unusual type of pleuro-pulmonic infection, at present characterized as a streptococcic empyema. Much has been written lately concerning this disease, but no earlier references to it have been noted, nor is it described in such standard literature as is available. The set of conditions incident to its onset and course are so distinct

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and characteristic, that if it had been previously encountered it must undoubtedly have excited interest and been accurately described.

It was recalled that James Mann, an American army surgeon during the early part of the nineteenth century, had described in his "Medical Sketches of the War of 1812-13-14," a severe and unusual type of pneumonia, or *peripneumonia notha,* as he called it. A copy of this work was obtained from the extensive private library of Maj. Stanton Friedberg, M. R. C., and the descriptions of peripneumonia notha were compared with the manifestations of streptococcic empyema. In the opinion of those who made the comparisons, the diseases are practically identical. Certain of Mann's descriptions are quoted below:

"On the northern frontiers, it assumed forms highly inflammatory. . . . In the vicinity of New York City, the disease supervened with symptoms less inflammatory. At Washington City, the disease exhibited few or little symptoms of inflammation, and was considered a form of typhus fever. This epidemic most generally obtained the same nosological appellation; but in different districts of the country was qualified by some specific name, which was supposed to be applicable to its existent form. In addition to its generic denomination, pneumonia, it was called at one place, pneumonia notha; at another, pneumonia typhoides; malignant pleurisy at a third; and at a fourth, bilious pneumonia. . . . This epidemic, when it first appeared on the northern frontiers, was accompanied with symptoms so uncommon, that some physicians were induced to consider it a new or anomalous disease. It was not correctly understood by the surgeons of the army, until its nature was ascertained by dissection of those who were its victims."

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"It was not a mere local affection at its onset, as is the pleuritis vera: all the membranous parts partook of the disease, in low or high degrees. The scarlatina which was a companion of the pneumonic symptoms, as well as a few cases of genuine erysipelas, favors this opinion."

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CASES OF DISSECTIONS

Case third . . . "A pint of yellowish or whey-colored lymph was effused into the cavity of the thorax. The inside of the thorax was lined with a thick membrane of coagulated lymph. The pericardium contained eight ounces of whey-colored lymph, in which were floating coagulated lymph resembling cheese curds." . . .

Case sixth . . . ; "the left cavity of the thorax was filled with yellow water. . . . The cavity of the abdomen contained at least two quarts of water similar to that in the thorax;"

Case eleventh. . . . "Each cavity of the thorax contained three pints of water, rather serum, limpid and glutinous, resembling whey

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in color. . . . Adhesions had formed to the spine, ribs, clavicle, and pericardium. . . . There was found adhering to the pleura and lungs a membrane of coagulated lymph. . . . The pericardium contained a fluid similar to that in the thorax, but more glutinous."

It is obvious from the foregoing notes, that the disease occurred at times in the form of a *general serositis*, such as has frequently been observed in the present epidemic.

Surgeon Mann was not only an acute observer of disease conditions and a skilful practitioner, but he was also a military medical administrator of high character, as his writings clearly show. Many of his sage aphorisms are as applicable to modern conditions as they were to those of his own time, more than a century ago. Certain of his "sketches" might well have been written of the experiences of our Medical Department only last winter. For instance:

"The requisitions upon the Quartermaster General's Department were so pressing to furnish materials for barracks, little or nothing adequate to the erection of hospitals could be obtained. My most pressing remonstrances for the neglect of the hospital department were not or could not be regarded, so long as the barracks for the troops were considered the primary object."

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"Now it was the chief surgeon . . . found himself loaded with a weight of censure; of which he should be fairly exonerated . . . "

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"The deaths, sickness, and distress at French Mills excited general alarm. . . . In all such cases censure will fall on some department. And as each was disposed to exonerate itself, upon which was blame more probably to have alighted than the medical; . . . it was incorrectly inferred, . . . the mortality was a consequence of injudicious management, or neglect of duty."

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" . . . The surgeons of the army are made mere scapegoats on whom are heaped a multitude of sins; which . . . are imputable to causes, over which they have no control."

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"At the commencement of the war most unfavorable representations were publicly made of every department of the army. The medical in connection with others was exhibited in reproachful language. The bad management of hospitals was a subject of animadversion. The physicians and surgeons of the army were either ignorant of their professions, or inattentive to their duty. The distresses of the sick were portrayed in gloomy colors."

"Visitors from remote parts always expressed astonishment on finding the condition of the sick far more comfortable than was expected from representations received."

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CURRENT LITERATURE

Structureless Skin-sliding Method for the Radical Treatment of Lung Abscess and Chronic Osteomyelitis, specially adapted to War Wounds, by Emil G. Beck, M.D., F.A.C.S., Chicago. ***Surgery, Gynecology and Obstetrics*****, vol. xxvi, No. 3, March, 1918, pp. 259-274, with 9 plates and 36 figs.**

The radical cure of lung abscess and of chronic osteomyelitis by the "structureless skin-sliding method," advocated and elaborated by the author, seems almost sure to find its place in post-bellum military surgical procedures, if not at the front. The author, however, distinctly states that his remarks are confined to the late cases, those in which the prophylactic methods of immediate wound sterilization, such as were introduced by Carrel and others, had failed to prevent chronic suppuration. But many such cases will, undoubtedly, accumulate in our home hospitals and require treatment if the war should be prolonged.

The reviewer, by way of merely calling attention to the article and of emphasizing its importance, without entering into the descriptive details of the technique of the operation, may be permitted to point out what seem to him the more fundamental principles upon which the method stands and upon which its future employment and usefulness must rest their case.

Granting that the mechanical cleansing of fresh gunshot wounds of the extremities, followed by their further treatment by disinfectants in watery solutions, will probably never again be altogether abandoned, that the results obtained by these methods have been excellent; neither mechanical cleansing nor watery disinfectants can be applied with the same success to lung infections, nor even to the deeper wounds, complicated by long, narrow, tortuous sinuses in other parts of the body, especially not, when they are complicated by extensive bony injuries. Besides, we can never lose sight of the fact that all watery solutions admitted to wounds of an infected character serve as dispersing agents of bacteria.

The method, introduced by the author about ten years ago, of treating lung abscesses, after proper draining, by a 10 per cent bismuth-vaseline paste, aside from having met with general approval by the profession, will stop, according to our author, suppuration in 4 out of 5 cases. It certainly is an interesting question of how such a paste effects such a cure. Assuming, on purely theoretical grounds, that the vaseline, during its contact with the walls of the abscess, at the body-temperature, will permeate them, will form a sort of emulsion with the alkaline secretions, engulfing, at the same time, the staphylococci, in which the bacteria may be considered as the "dispersive phase" and the vaseline the "dispersoid," it is not difficult to imagine conditions to

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arise that are unfavorable to the life of staphylococci, still further aided by the presence of the mild disinfectant action of the bismuth, and finally causing their death by starvation and plasmolysis. Once the bacteria are eliminated, healing, under a thin film of the vaseline, would then proceed under more favorable conditions than without such a protective covering.

With reference to the covering of the abscess cavities and sinuses, whether these are the results of disease or injury, after the method of sliding-skin flaps, it would seem to the reviewer the ideal method, the very method by which Nature herself (whatever that may be understood to mean), was determined in all her constituent parts to employ, in order to effect a final cure in all such injuries; the surgeon, with his skin flaps, merely coming to her aid and interpreting aright her intentions.

H. G. Beyer.

Clinical and Histological Studies on the Cicatrization of Burns under Dressings of Paraffine, by M. Fauré-Fremiet and M. Pfuhl. *Bull. de l'Académie de Médecine*, Seance du 29 December, 1917, p. 809.

The authors report some rather noteworthy observations on the course of the process of cicatrization in burns, under paraffine dressings. Their observations were made on a large number of patients at the hospital Saint-Nicolas (Issy-les-Moulineaux), in the service and according to the method of Dr. Barthe de Sandfort.

From a clinical point of view, the pain, even in large burns, diminishes, the slough disappears and the wound assumes a reddish hue, beginning to granulate normally. As granulation proceeds, the entire raw surface of the wound is becoming covered by a puriform exudate, essentially made up of leucocytes (polynuclear neutrophiles) and a serous fluid; it is impregnated invariably—and the authors insist upon this point—with a large number of living bacterial elements, in spite of the presence of an active phagocytosis. These bacteria consist of facultative anaerobes such as staphylococci and streptococci, bacillus pyocyanicus and some atmospheric microbes.

In order to establish a basis for the rate of cicatrization in wounds under a paraffine dressing, our authors made successive measurements of the wound surfaces, according to the method of Carrel and Lecomt du Nouy. They found that the rate of cicatrization was generally regular, following exactly the theoretical curve. On comparing the curves thus obtained with those obtained from wounds treated by the method of Carrel, they found them to be the same, or even superior, in rapidity of cicatrization, to those of the wounds treated by the fluid of Dakin. The authors themselves remark that "If we consider that the former are always the seat of an abundant suppuration, this finding could seem paradoxical."

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From the histological point of view, cicatrization occurs by a rather rapid formation of a loose, structureless mesenchymatous layer, in which vascular formation is very active; the principal elements in this mesenchyma, most generally oedematous, are fixed connective tissue cells, of which a large number show mitotic division, and motile cells, specially polynuclear leucocytes, which are in constant motion; the granulating surface is thus covered by a false membrane, formed by a large number of leucocytes, enclosed in a net of coagulated albuminoid substances; the membrane seems to be one of temporary protection and disappears in proportion as epidermization advances.

Epidermization proceeds in the well-known classical way and may be very active.

From a bacteriological viewpoint, no microbe could be discovered in the newly formed tissue, underneath the superficial false membrane. Whenever an accidental infection underneath this false membrane did occur, the granulating tissue concerned underwent necrosis and a secondary sphacelus was formed.

The authors, basing themselves on their observations, believe themselves entitled to conclude that the infection of the wounds which they have studied remains strictly superficial, and this they attribute to the action of the leucocytes that continually traverse the granulating tissue and to the barrier represented by the false membranous covering. The newly formed tissues, then, under a paraffine dressing, develop aseptically by the simple function of the normal defenses at the disposal of the organism and without the aid of the intervention of any antiseptic substance—a very important conclusion, if confirmed.

H. G. Beyer.

Aeroplane Accidents, by Temp. Surgeon H. Graeme Anderson, M.B., Ch.B., F.R.C.S., R.N. *Journal Royal Naval Medical Service,* Vol. iv, No. 1, January, 1918, pp. 51-68.

"The total number of accidents due to school work and experimental flying is greatly augmented by the number due to war flying, either as the result of aerial duels or anti-air craft fire from the ground."

The author distinguishes between a *"crash"* in an aeroplane and the effects on it of a *"bad landing;"* in a crash the aeroplane is so damaged that it has to be sent to a workshop for repair or rebuilding; in a bad landing the damage is small and can be repaired by the flight mechanics. Thus, fifty-eight crashes in 9,000 flights represent one crash in every 155 flights. In these fifty-eight crashes sixteen were injured, which is equivalent to twenty-eight being injured in every 100 crashes, or one pupil injured in every 560 flights.

In one of the accompanying charts, exhibiting the number of crashes that occurred during the first two solo flights, it is shown that

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the greater number occurred during the first seven flights; then there follows a rapid diminution in crashes from the third to the sixth inclusive and a rapid rise again in the seventh. The inference suggested is that by the time the pupil arrives at his seventh solo he often becomes overconfident and a little careless.

The causes of aeroplane accidents are enumerated as follows: (1) Defect in aeroplane; (2) error of judgment in flying; (3) loss of head; (4) brain fatigue or lethargy; (5) fear; (6) physical illness; (7) unavoidable causes. Among these causes, errors of judgment are blamed in 42 out of a total of 58 accidents; next in frequency stands "loss of head" which accounts for 7 out of 58 accidents. Of the 58 crashes, forty-two were due to errors of judgment, four of them occurring in getting off the ground and thirty-eight in landing. As examples of loss of head in the air the pupil, in an emergency, may move the throttle the wrong way, may keep his engine full on when he should throttle down, or may switch off his engine at a moment when he requires all the flying speed possible.

In brain fatigue, the pupil has neither the power "to reason, decide nor act." A state of mental inertia supervenes. The author is convinced that brain fatigue is a cause of a fair proportion of aeroplane accidents. "If one questions a suspected case of brain fatigue immediately after his flight one finds usually that the pupil has very little recollection of what he did in his flight. Memory seems to become partially stunned."

With regard to the subject of fear, the author states that from an analysis of the confessions of the first solo flights of 100 pupils, he noted that very few experience fear in the air, at least not sufficient to disturb their flying.

Concerning physical illness, the author finds that the effects of cold and fatigue may produce faintness or stupor in the air. Some have been known to recover consciousness before reaching the ground and have been able to make successful landings. Two of his pupils suffered from attacks of malaria in the air and both were made to discontinue flying.

The paper goes into detailed discussion with regard to types of accidents, gives a scheme for first aid at an air station, speaks of the use of safety belts, safety helmets and goggles and describes minutely a series of fatal accidents and regional injuries and the manner of their occurrence and treatment. A very timely paper to be recommended for perusal and study to all those engaged in similar duties on aviation drill-grounds.

H. G. Beyer.

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BOOK REVIEWS

Thyroid and Thymus, by André Crotti, M.D., F.A.C.S., LL.D., with 96 illustrations and 38 plates in colors. Philadelphia and New York: Lea and Febiger, 1918.

This truly great work will easily find a place among the "Classics" of American medical literature. The publishers, in just appreciation of its value, have given it the distinction it deserves by causing it to make its entry into the profession in the festive garments of an *"edition de luxe."* It is a mine of information for specialists, drawn from every conceivable scientific and practical source, handled by a master mind, equally proficient in the scientific as in the practical aspect of his chosen subject. For the general practioner it must be a positive revelation when he finds what a wide and comprehensive knowledge of and practical acquaintance with all the different departments of medicine and surgery it is nowadays necessary to possess in order to treat, with anything like success, any subject exhaustively in the domain of our profession, be it ever, apparently, so insignificant.

The embryology of the gland has been brought up-to-date and the classification of tumors placed into harmony with it. With regard to the physiology of the thyroid, while the old theory of the gland acting under certain conditions as a mechanical means of regulating the cerebral blood supply, is not absolutely denied, it is justly held that the thyroid is, primarily, a glandular organ of great importance in metabolism and not a cavernous organ. The influence of the absence of the gland or thyroidectomy on infantile development and the degenerations occurring in animals and man is clearly demonstrated. The difference in the physiological influences between the parathyroids and the thyroid on the pathological conditions following their respective removal is distinctly shown; the nervous symptoms and convulsions being attributive to injury of the parathyroids, whereas myxedema is recognized as following thyroid insufficiency. Reference, in this connection, is made to the classic and decisive experiment of Halsted in which he showed that the removal of the four parathyoids in an animal proved absolutely harmless, provided that one of these glandules was successfully transplanted into the abdominal wall. In general terms it must be said, to the credit of the author, that no contributor of any distinction, and who has added to our knowledge of the subject, can possibly complain of not having received due attention by the author.

The light turned on the subject under discussion by biological chemistry has been thoroughly utilized. It is mentioned that Kendall isolated a crystalline iodine (60 per cent) compound from the thyroid in 1914, said to be locked up in the protein molecule and the effect of which was that it gives all the results of thyroid administration. The

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seasonal variations in the percentage of iodine present in the healthy, noted by Seidell and Fenger, are cited: "It is not possible to detect any pathological difference between animals which have a high percentage of iodine in their thyroids and those which have none and, thyroidectomy is followed by as severe symptoms in the latter cases as in the former," while others, Roose, Oswald, Marine and Williams, as also Halsted, hold diametrically opposite views. Our author holds that iodine treatment is the only logical treatment of the condition in Grave's disease. The relative bearing of biological chemistry on the whole question is so vast and, so thoroughly and minutely discussed at the same time, so illuminating that the reader must be referred to the original for an adequate notion of its value.

The chief merits of our having come nearer to the solution of the iodine question, the author unhesitatingly attributes to the work of Reid Hunt and Atherton Seidell, and also cites Oswald's myxedematous boy, 18 years old, measuring 131 cms. in length, who took 0.1 gm. of iodothyreoglobulin for 21 months and grew during that time 21 cms. Nor are, according to our author, arsenic, phosphorus, sulphur, the lipoids and certain of the ferments to be considered without their physiological and chemical values; he believes the function of the thyroid to be multiple. In Chapter iv the interrelation of the thyroid with the other endocrinous glands meets with an adequate consideration. The reviewer feels impelled to record his great satisfaction with the author's personal, but fair, impartial and judicious criticism with which he weighs every contribution to his subject in the balance.

Under *"pathology,"* the etiological development of tumors from the thyroid, is, to a great extent, still veiled in a maze of developmental mysteries, difficult to disentangle; the homologies of tumors of the thyroid and of other organs as the testicle, ovary and kidney, are pointed out with an indefatigable energy and most painstaking thoroughness. Tumors with cylindrical epithelium from the thyroglassus duct are said to find their analogies in tumors developed from Wolf's canal; mixed tumors of the thyroid originating from the bronchial bodies find theirs in the mixed tumors of the kidney, originating in the primitive scleromyotomata. In the purely scientific classification, based upon embryology, the benign and malignant tumors are mixed up. The classifications favored by our author is consequently one in which the clinical features find due consideration. Every class of tumor is amply illustrated by drawings and colored plates, given a fitting nomenclature and provided with a concise description, doing, nevertheless, full justice to clearness and completeness *"Se non e vero ben trovato."*

Most interesting is the reference made to metastases of the thyroid: "How is it that malignant cells which cannot be differentiated from normal ones will be carried away by the blood stream and will not grow upon a strange land but will also not be deprived of their

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physiological action which is the calloid secretion? A similar feature does not occur in cancerous metastases of other organs. Metastases of the breast do not secrete milk, nor does a metastasis of the liver secrete bile nor a metastasis of the kidney urine. Who can give an answer?"

Under "*Inflammation of the Thyroid,*" the author states that, in his judgment, a bacterial, non-purulent thyroiditis "is only a phase of a process whose last act is suppuration." "If we should consider a goitre as the result of an infectious process, the goitre in itself would be a thyroiditis and strumitis, would then become only an epiphenomenon of a previous infection." "Thyroiditis and strumitis have been found to follow not only pneumonia, typhoid, tonsillitis, puerperal infections, gastritis, enteritis, pyemia, but also scarlet fever, diphtheria, malaria, influenza, smallpox, measles, cholera, dysentery, mumps and inflammatory rheumatism." The symbiosis of anaerobic organisms with streptococcus is frequently found in gangrenous thyroiditis."

In the chapter (vi) on the anatomico-pathological relations of goitre to the surrounding structures, the very clear illustrations and colored plates are most helpful; goitre heart and intrathoracic goitre are described in special paragraphs.

One of the most thrilling chapters in the book (xvii) is the one devoted to the etiology of endemic goitre and cretinism and the, by no means, least interesting portion of the chapter is the one referring to their history. Although known to the Hindus 2,000 years before Christ and despite all modern investigations and researches, their etiology remains to this day one of the most obscure of medical problems. The literature is immense. The catalogue of the Surgeon General's Office, U. S., gives 1,857 publications, and the recent collection of Schols records 2,486 publications on cretinism alone. It is pointed out that goitre and cretinism invariably coexist; their respective causes are considered to be identical. The author, quoting from a monograph of H. Bircher, gives it as the latter's conclusion "that endemic goitre, deafmutism and idiocy are only different degrees and ultimate results of one and the same degenerative process." These assertions are largely supported by statistics and the distribution of the disease is simply world-wide.

With reference to the military significance of endemic goitre and cretinism in some countries, Crotti quotes from an article by Dr. Oswald in which it is stated that, in Switzerland, "3,000 recruits are annually rejected because of goitre and should we continue our calculation through the 10 years of Swiss military duty, we come to the enormous figure of 30,000 or nearly one-fourth of the Swiss Army." As goitre epidemics are known to occur in barracks, boarding schools, seminaries, prisons, in endemic centers, sometimes even in ships, overcrowding seems to stand in some causative relation to their occurrence.

"In all the literature which has come down to us throughout the ages, there is but one conclusion which is constantly and predominat-

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ingly present, *i. e., "the relation existing between water and goitre,"* and many instances are recorded where boiling the drinking water was sufficient, while mere filtration was not, to prevent the occurrence of goitre in endemic territory and also where rain water protected against the disease.

The weight of evidence seems, very decidedly, to favor the parasitic rather than the chemical nature of the contagion, although Bircher is convinced that the goitre toxin is of colloidal nature and that this is washed or soaked out of the rocks by water. Bircher, one of the highest authorities on the subject, is quoted as concluding that (1) goitre occurs upon marine deposits and, especially, upon marine sediments of the paleozoic, triassic and tertiary periods, and (2) that the eruptive rocks, the crystalline rocks of the Archean groups, the sediments of the Jurassic, Cretaceous and Quaternary seas and all fresh water deposits are free from goitre. "Animals acquired goitre when drinking water from goitre springs both in the natural state and after having been passed through Berkefeld filters." Repin's *plutonian theory* attributing the capital importance to the chemical ingredients of goiterigenous waters, especially salts of lime—in which J. Loeb's investigations on the action of calcium ions are drawn upon—and magnesium in combination with radio-active substances, is given extensive and minute consideration. Kutschear's theory, attributing the disease to the effect of the goiterous agent upon the thyroid gland through its action on the nervous system, as well as the theory of Taussig and of McCarrison, receive well-earned consideration.

In the succeeding chapters on *Thyrotoxicosis*, syn. *Grave's Disease, Basedow's Disease, Exophthalmic Goitre, Mayo's Hyperthyroidism;* those devoted to the treatment, prophylactic, medicinal and surgical; to symptoms, complications or differential diagnosis, the student will find that they all bespeak the characteristic and most impressive thoroughness of the author and the completeness of his work.

The *Thymus Gland,* its embryology, histology, surgical anatomy, involution, experimental pathology, are given in chapter li; the surgical technique of thymectomy forms the closing chapter in the book. In both these chapters the clear text is beautifully illustrated by plates in color.

While reading the paragraph under *"Involution of the Thymus"* and the author's quotation of Hammar to the effect that "this gland reaches its maximum of size between the eleventh and fifteenth year, its normal weight, during these years, being given as 3.7 grams," and which is also the greatest weight that the gland attains during life, the reviewer was reminded of the coincident fact, brought out prominently in all growth statistics of children, that this interval is also that period during which children grow most rapidly. A well described and illustrated operation of thymectomy ends this remarkable book.

H. G. Beyer.

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CLINICAL AND LABORATORY NOTES

ON THE OCCURRENCE OF SPIROCHETES IN THE URINE

By RALPH W. MENDELSON, M.D.

Sanitary Expert to the Royal Siamese Government

Introductory Note.—Since the discovery of the cause of Weil's disease many observers have reported the occurrence of spirochetes in the urine of cases of trench fever,[1] but so far no animal experiments have been reported that tend to prove the organism found is the real cause of the disease, although great importance is attached to the above findings.

Stimulated in part by the work of Stoddard[2] and also by the numerous communications regarding the finding of spirochetes in the urine of cases of trench fever, it was thought that the examination of the urine of patients, far distant from the seat of war and in a country in which, so far, no cases of the above disease have been observed, might be of interest and perhaps value.

Type of Cases and Method of Collecting Samples.—The cases are from the out-patient department of the Police Hospital, all males, and taken in consecutive order as they appeared for treatment, except the leprosy cases, these latter patients being confined at the present time in a part of the city jail. The surgical cases were mostly minor ones and all such, in the accompanying table, were medically negative. Wherever possible the clinical diagnosis was confirmed by the laboratory. In a few cases marked "fever" it is to be understood that a diagnosis depended upon further observation and that the patient either did not return for treatment, or that at the time of writing this paper a diagnosis had not been made.

One might object to the results obtained, due to the fact that none of the specimens were catheterized, but it is not only impracticable, but also not justifiable to subject patients to an unnecessary and possible dangerous procedure when the case does not call for it. The following method was used and, I think, gives a fair sample of urine as it is found in the bladder before coming in contact with the urethral flora. The samples were collected in sterile test tubes. The patient was subjected to the usual cleansing process and then instructed to urinate, the past portion being used for examination.

[1] Patterson, *British Medical Journal*, September 29, 1917. Nankivell and Sundell, *Lancet*, November 8, 1917.

[2] Stoddart, *British Medical Journal*, September 29, 1917.

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The urethra was therefore washed out with the urine itself before a specimen was taken, care being taken to allow the patient to micturate freely to clean the urethra and, if the last portion was not sufficient to fill the centrifuge tube, distilled water was added to make up the amount.

At the close of the clinic the samples were at once sent to the laboratory. They were centrifuged for fifteen minutes, the residue collected on a sterile slide and dried in the drying oven. The preparation of the films is a simple matter, and as for the staining, it was found very satisfactory to use Giemsa stain. The various methods, such as silver nitrate and tannin, India ink, etc., were all tried, but it was found that simply fixing in heat and staining with Giemsa, using heat as an intensifier, produced equally good results. The spirochetes stain an intense blue and are very easy to recognize. As a matter of fact it seems that the silver nitrate method produces an undue amount of fatigue on the eye when many slides are to be examined, one after the other, while on the other hand the Giemsa method produced no such effect.

Presence in the Urine.—A slide was never termed negative unless at least twenty minutes had been spent on it. The number of spirochetes is so variable that often not more than two or three would be found and then again the slide would be practically covered with them. It was also found that the greater the residue the more often was the specimen positive. This may be either due to the fact that the greater amount of debris assists in a mechanical way to carry down the spirochetes while the specimen is being centrifuged, or it may simply mean that the spirochete is more apt to be a part of the urinary flora when we are dealing with urines containing large amounts of foreign material.

Morphology.—After the examination of a number of positive slides one is soon impressed with the great variety of spirochetes found; in fact, the most distinctive feature is the multiformity. In length they varied from 3μ to 13μ although the average is from 5μ to 8μ. Many of them were short and thick while, on the other hand, some were found almost thread-like and with fine, tapering ends, but capsules were not made out. Some had many spirals, while others were almost straight. It was not uncommon to find in the same specimen a great variety of the organisms, some short, some long, some with many spirals and some with few. From the above it is quite evident that, from a morphological standpoint, the organisms found possess no distinctive feature, also that many specimens

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No.	Diagnosis	Spirochetes	Remarks		
			Length, μ's	Frequency	Spirals
1	Surgical	Negative			
2	Surgical	Negative			
3	Surgical	Negative			
4	Surgical	Negative			
5	Surgical	Negative			
6	Surgical	Positive	4–6	Few	Many, thread-like
7	Surgical	Positive	3–7	Many	Many
8	Surgical	Negative			
9	Surgical	Negative			
10	Syphilitic arthritis	Positive	6–8	Few	Many
11	Perforating ulcer, foot	Positive	6–8	Few	Many
12	Tropical ulcer	Positive	4–0	Few	Few
13	Beri-beri	Negative			
14	Syphilis, tertiary	Positive	6–8	One	Few
15	Chronic nephritis	Negative			
16	Normal	Positive	8–10	Few	Few
17	Perforating ulcer, foot	Negative			
18	Sub-tertian malaria	Positive	5–8	Few	Few
19	Sub-tertian malaria	Negative			
20	Surgical	Positive	4–8	Many	Few
21	Surgical	Negative			
22	Syphilis, tertiary	Positive	10–12	Many	Few
23	Cataract	Negative			
24	Beri-beri	Positive	4–6	Few	Few
25	Surgical	Positive	4–8	Few	Few
26	Tropical bubo	Positive	6–12	Few	Many
27	Sub-tertian malaria	Negative			
28	"Fever"	Negative			
29	Acute arthritis	Negative			
30	Tropical boils	Negative			
31	Sub-tertian malaria	Negative			
32	Syphilis, secondary	Positive	5–10	Few	Few
33	Normal	Negative			
34	Normal	Positive	3–6	Few	Few
35	Beri-beri	Negative			
36		Positive	4–10	Few	Many
37	T. B. glands of neck	Negative			
38	Tropical bubo	Positive	3–8	Many	Many
39	Syphilis, tertiary	Positive	4–8	Many	Almost straight
40	"Fever"	Negative			
41	Chronic interstitial nephritis	Positive	5–10	Many	Variable
42	Surgical	Negative			
43	Syphilis, secondary	Negative			
44	Abscess of jaw	Negative			
45	Chronic arthritis	Negative			
46	Tinea flava	Positive	4–8	Many	Few
47	Beri-beri	Negative			
48	Surgical	Negative			

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No.	Diagnosis	Spirochetes	Remarks		
			Length, μ's	Frequency	Spirals
49	Scabies	Negative			
50	Surgical	Negative			
51	Surgical	Negative			
52	Surgical	Negative			
53	Sub-tertian malaria	Positive	5–10	Many	Variable
54	Amebic dysentery	Negative			
55	Elephantiasis of scrotum	Negative			
56	Leprosy	Positive	4–7	Few	Few
57	Arthritis deformans	Negative			
58	Acne Vulgaris	Negative			
59	Surgical	Positive	5–10	Few	Many
60	Pharyngitis	Positive	8	Few	Few
61	Tinea asiatica	Negative			
62	Acute multiple arthritis	Negative			
63	Bacillary dysentery	Positive	4–8	Many	Many
64	Bronchitis	Negative			
65	"Fever"	Positive	6	Many	Almost straight
66	Surgical	Positive	10–13	Few	Almost straight
67	Beri-beri	Positive	8	Many	Many
68	Amebic dysentery	Negative			
69	Syphilis, secondary	Positive	10–14	Many	Few
70	Scabies	Negative			
71	T. B. glands of neck	Negative			
72	Surgical	Negative			
73	Syphilis, primary	Negative			
74	Surgical	Positive	4–8	Many	Many
75	Syphilis, primary	Negative			
76	Syphilis, tertiary	Negative			
77	Leprosy	Negative			
78	Tropical ulcer	Positive	3–6	Many	Many
79	Yaws, secondary	Positive	8	Few	Many
80	Surgical	Negative			
81	Beri-beri	Positive	6–10	Few	Few
82	Surgical	Negative			
83	Surgical	Negative			
84	Amebic dysentery	Negative			
85	Sporotrichosis	Negative			
86	Surgical	Negative			
87	Trachoma	Negative			
88	Small-pox	Negative			
89	Acute arthritis	Negative			
90	T. B. of lungs	Negative			
91	Muscular rheumatism	Positive	5–9	Few	Many
92	Leprosy, mixed	Negative			
93	Leprosy, mixed	Positive	5–12	Few	Few
94	Leprosy, tubercular	Negative			
95	Leprosy, mixed	Negative			
96	Leprosy mixed	Negative			
97	Leprosy, mixed	Negative			
98	Leprosy, mixed	Negative			
99	Leprosy, anesthetic	Negative			
100	Leprosy	Negative			

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examined show a type of spirochete similar to that described by other observers as occurring only in the urine of cases of trench fever.

Results and Conclusions.—Of the one hundred specimens examined thirty-five are positive. In other words, 35 per cent of one hundred out-patients taken in consecutive order as they appeared for treatment, with the exception of the last nine leprosy cases, harbor spirochetes in their urine. Many of the spirochetes found are similar to those described as occurring in cases of trench fever. The following diseases gave positive results. As stated above, surgical cases are medically negative, being of a minor character and seldom remaining in the hospital over night.

Surgical; syphilitic arthritis; perforating ulcer of the foot; tropical ulcer; syphilis, primary, secondary and tertiary; normal; sub-tertian malaria; beri-beri, both wet and dry; tropical bubo; chronic interstitial nephritis; tinea flava; leprosy, mixed; acute pharyngitis; bacillary dysentery; "fever"; yaws; muscular rheumatism.

From the above, the great variety of diseases combined with the multiformity of the organism found, one feels justified in stating that the spirochete is a part of the normal urinary flora and that up to date no convincing evidence has been produced to show that the organism described as occurring in the urine of cases of trench fever has anything to do with the etiology of that disease.

TWO CASES OF ANTHRAX OCCURRING IN TENT-MATES

By Captain HENRY K. GASKILL
Medical Reserve Corps, U. S. Army

(With two illustrations)

While the statement made by Osler that no cases of anthrax occur spontaneously is absolutely correct, yet conditions under which this disease may occur would make it appear from a superficial standpoint at least, that such a phenomenon could take place. Usually, however, there is a more or less direct history of personal contact with horses, sheep or cattle, or with the hides of such animals and through which it is possible to trace the source of infection, but occasionally after the most careful and persistent inquiry, it is impossible to ascertain the direct cause. The infection may have been by such indirect means, so remote from ordinary channels that, without the knowledge of the long life of the spores, one could be almost convinced of the possibility of spontaneous oc-

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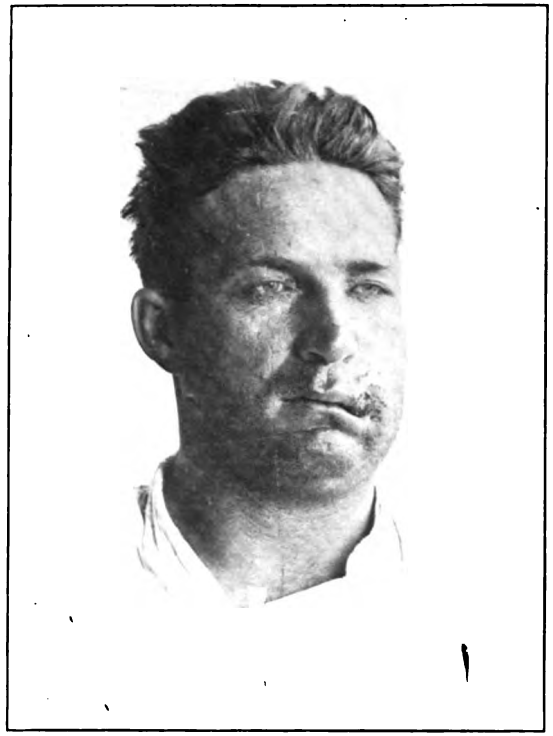

FIG. 1.—ANTHRAX INFECTION OF FACE.

(To face page 104.)

FIG. 2.—ANTHRAX INFECTION OF FACE.

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currence. The germ itself—bacillus anthracis—is readily killed, but the spores are highly resistant to heat and to the ordinary methods of sterilization, and are capable of reproducing the disease in persons and animals after long intervals of apparent inactivity.

While the disease is by no means common and represents a very small percentage among diseases of the skin, yet it is one of the conditions against which wool sorters, leather workers and those working in kindred trades must be constantly on the alert to prevent its occurrence. Of the three types, the cutaneous, pulmonary and intestinal, the first is by far the most commonly observed, not only on account of the difficulty in diagnosing the pulmonary and intestinal types, but largely on account of the readiness with which the germs may gain entrance through small abrasions in the skin. Facilities are not available at the present time for reference as to the comparatice frequency of the situation of the malignant pustule as it is called, when occurring on the body surface, and it may be a coincidence, but there has only been one case of the few I have personally observed, not on the face. This is not at all strange when one considers that men who handle hides and wool, as do those in other trades, soon acquire a very thick skin on the hands, which will act to some extent as a barrier to the entrance of germs; they will, however, at frequent intervals rub their hands over the face to wipe away the perspiration and unconsciously carry to the more tender skin the germs which were inactive on the hands. Numerous small abrasions are constantly produced by shaving, and it is these that are the portals of infection.

The history of these two patients with anthrax is unusually interesting, not only from the fact that, as far as was known, they had not been exposed to any of the usual methods of infection, but that seven other men had been sleeping in the same tent, under the same conditions, for several weeks and none of whom had shown a trace of the disease. None of these nine men had in any way handled, as far as was ascertainable, any horses, cattle or sheep. They all came from the same town in Wisconsin and had all been friends. The infecting cause must, therefore, have been some one thing that had been used by these two men in common, as is evinced by the fact that the initial lesion made its appearance on the same day and in each case in the face. If it had been something with which they had come in contact in their daily routine in camp, there is some likelihood that others would have contracted the disease through the same source.

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A careful watch it kept for any suspicious looking lesions. We have many cases of impetigo and pyodermia in the camp and each one is being carefully observed to see if what may appear to be one of these extremely benign conditions may develop later into a very serious disease with a high mortality rate.

The blanket was considered as being a possible mode of infection, but it is highly improbable that this could have been the source, as the process by which they are manufactured would under ordinary conditions render them sterile as far as being carriers for such germs is concerned. No new clothing or equipment had been issued these men since the middle of August, and with the exception of a cake of shaving soap, the two patients had not bought any articles in the city of Waco for two weeks prior to the onset of the disease, other than cigarettes. One man acknowledged having had intercourse with a prostitute a few days before the eruption was noted, but that method, with other sources of contagion, could be readily excluded from the very significant fact that the first sign of an eruption was discovered on both patients on the same morning. It must have been something, therefore, that both had used on or near the same day, and after most careful inquiry it was found that the only thing that they had used in common was the cake of shaving soap which one of them had bought and which both had used four days prior to the initial lesion. Unfortunately, this cake of soap with the two shaving brushes had been burned with their other effects before a microscopic examination could be made.

At this time, when tetanus germs are being implanted on adhesive plaster and ground glass put in packages of breakfast food and canned vegetables, it is quite natural to put the blame on our enemy for such diabolical practices, when want of any direct evidence is lacking, and who would be just as liable to employ the long-lived spores of anthrax as other germs equally as deadly. It will always be a matter of great regret that this soap had been destroyed, for if it had been part of a "poison plot" an early exposé might have prevented many other so-called sporadic cases of anthrax.

On the morning of October 16, 1917, Case 1, while working in the company kitchen noticed a small "pimple" on the left side of the upper lip, and on returning to his tent told his friend, Case No. 2, of it in a casual way, and then remarked, "You have one just like it on your cheek." This emphasizes the fact that there must have been a common carrier and that the infection was not conveyed from one to the other after the disease had started, for if that had been the

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case, there would have been the interval of incubation period before the second case developed. Both patients were admitted to the skin ward of the base hospital, Camp MacArthur, on the 19th day of October, with lesions exactly similar in gross appearance and differing only in contour. The seriousness of the disease was immediately suspected, and they were isolated and material taken for cultures and smears at once.

At the same time, on account of this above mentioned similarity and of the character of the lesions, dermantitis facticia was suspected, pending a laboratory diagnosis. The clean-cut outlines, the black centers with the white eschars surrounding them made me strongly suspect the application of carbolic or nitric acid, especially the former, for I had seen several times similar looking lesions that had been self-produced in nervous or hysterical patients, and a year or so ago I published an article on "Dermatitis Facticia," with a record of several cases of this kind. Such practices are, I believe, not uncommon in the Army, as a discontented soldier will resort to many and unique methods in order to obtain his discharge, and surgeons are constantly on the guard for such malingering. The accompanying photographs were taken four days after their admittance to the hospital, but unfortunately do not show the condition as it really existed on admission, as there is no suggestion of the typical vesiculation that was present earlier. They do show, at least, the thick crust and the edema that was still present at that time and which was less marked than it was four days prior.

REPORT OF CASES

Case 1.—H. P. J., white; aged 32; American born; had been in service three months; was a painter by occupation; had never had painter's colic nor other manifestations of lead poison; denied venereal history; had been a heavy drinker and a moderate smoker for years but had always considered himself a healthy man. Had had measles and mumps and typhoid fever in 1903. He left his home town with the other members of his company August 3, 1917. Had been ten days in Camp Douglas and reached Camp MacArthur August 16, 1917. Except for a very slight diarrhea, for which he took no treatment, he had been perfectly well while in camp. In addition to regular drills, he had been doing kitchen police, and to his knowledge had not come in contact with horses, cattle or sheep since his arrival. His entire equipment had come from Camp Douglas, and to reiterate, nothing new had been given him, nor had he bought anything in the neighboring town except tobacco since his arrival. On Saturday, the 13th of October, he shaved, using his own brush and razor but borrowing the shaving soap from

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Case No. 2. On Tuesday, the 16th of October, he observed a small "pimple" with a yellowish center on his left lip and which caused him no discomfort. It spread peripherally until on the 19th, the day of his admission to the base hospital, the lesion was the size of a ten-cent piece. It was then clean-cut with a punched out appearance, irregular in contour with a brown, black thick crust surrounded with a white eschar, and beyond that a distinct circle of vesicles. These vesicles were elongated, varying from ⅛ to ⅜ of an inch and radiating from the center as do the spokes of a wheel. There was a very slight amount of exudate and surrounding the entire area was a narrow zone of erythema. The entire left cheek was markedly swollen, the cellular infiltration extending from the eye to the lower border of the inferior maxillary bone. The patient claimed he felt perfectly well and had no subjective symptoms excepting a slight burning sensation on the left lip. Temperature on admission was 99.6; on the 21st it rose to 102; on the 22nd it was practically normal; on the 25th, 97.4; and remained to the date of discharge slightly subnormal. There has been considerable increase in the size of the lesion as shown by the photograph, and the crust became very thick and leathery. The exudate gradually ceased and the swelling subsided after the first week, the patient making an uneventful recovery. The only treatment given to this and to the other case was bichloride of mercury, one to two thousand wet dressings and constant exposure to the rays of the sun.

Case 2.—L. F., aged 27; white; American born; had been in the service three months; stone mason by occupation. Denies venereal history; had been a constant drinker, taking mostly beer. Two weeks prior to his admission to the hospital he had intercourse with a prostitute, but had not observed any suspicious eruption. Has had measles and mumps but no other disease and always considered himself a very healthy man. He came to Camp MacArthur at the same time with Case No. 1, and had had an attack of diarrhea, about the same time as did Case No. 1, and for which he also had taken no treatment. He had no special detail and had no knowledge of having come in contact with animals of any description. He had bought in the city of Waco one suit of underwear and a well-known brand of shaving soap, but not being familiar with the town, could not locate the drug store. On the morning of the 13th of October, his friend, Case No. 1, called his attention to a "pimple" on the right cheek and of which he was not aware. On the 19th of October, when he was admitted to the base hospital, he had one lesion about ¾ of an inch in diameter below and to the right of the lip; a smaller one was slightly posterior to that, and two still smaller below the angle of the jaw, in front of the ear; one small one later appeared at the corner of the mouth. His face was markedly swollen and he complained of considerable burning and stinging sensations. The character of the lesions was exactly the same as described in Case

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No. 1, except that they were here four distinct ones, while the former patient had only one. He had shaved on the 13th of October, using his own razor and brush and the cake of soap that he had purchased a few days previously. His temperature on admission was 99.2, soon became subnormal and remained so during his entire stay in the hospital. Large quantities of albumin were found in the urine and daily examination of the same showed a gradual decrease as the patient's general condition improved and the lesions involuted and had entirely disappeared before his discharge from the hospital.

LABORATORY REPORT[1]

Microscopic examination in both cases was exactly the same.

Base Hospital, Camp MacArthur, Waco, Texas,

October 29, 1917.

Specimen from *Malignant Pustule.*

Direct smears and cultures on agar, were made from the sero-purulent material obtained from the eschar.

Smears stained by methylene blue, Gram's stain and dilute carbol fuchsin —all showed typical pus cells present; some were found to contain the bacilli intracellularly. Gram's stain showed these organisms to be Gram positive.

Cultures at the end of 24 hours' incubation at 37° C. showed: typical greyish semitranslucent colonies which, under the low magnification, were found to consist of a dense network of fibrillae-like curled hair, in appearance typical of anthrax colonies.

Smears from the cultures showed typical anthrax bacilli, occuring in variously curved chains some spores present. A large number of staphylococci also present.

Cultures made October 24 showed practically a pure growth of *Staphylococcus aureus.*

Treatment.—While excision is advocated by many in the treatment of anthrax, it did not seem in my judgment, or of Major Morfet, M. R. C., that it should be employed on account of the marked infiltration, and, in Case 2, the four lesions might leave very bad cosmetic results; but surgery would, of course, have been resorted to if both patients had not shown improvement in such a short time. Neither of us had ever heard of the direct rays of the sun having been employed in the treatment of this disease, though others may have done so, but on account of brilliant results having been obtained in other conditions by this means, we felt justified in trying it, especially as the X-ray machine with which the hospital is now equipped, was not in operation and which would have been our treatment of choice had it been available. Nature's best remedy was undoubtedly the means of curing these two cases of anthrax, in which there is a recorded mortality rate of 26 per cent.

[1] For this I wish to thank First Lieutenant Medalia, M. R. C., pathologist to the base hospital.

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INSTRUMENTS AND APPLIANCES

THE ALLEN LEG SPLINT

By Major HORACE R. ALLEN

Medical Reserve Corps, U. S. Army

(With eight illustrations)

The splint is made of one piece of round steel painted black. It is in no sense a modification of the Thomas splint unless Thomas has a priority claim over all surgeons in making mechanical traction upon a lower extremity. This splint embodies principles employed by the writer for more than a score of years.

Beginning at the base, the Thomas splint pulls from a central notch as shown in Fig. 3, while the Allen splint (Fig. 4) makes traction from the two sides in direct line with what it pulls against. This is merely a trivial mechanical correction, although mechanically correct. It is quite obvious that the traction bandages can be wrapped around the lateral rods of the Thomas splint before tying them to the central notch (Fig. 5), but the distance between the rods being much greater than the width of the ankle the tendency is to pull the adhesive strips away from the leg instead of keeping them as tangent tractors. There is an element of time lost in wrapping the rods, insignificant in a single case, yet in thousands of cases it may run into days or weeks.

From the foot to the hip the Thomas splint runs in two diverging straight lines (Figs. 3 and 5), causing tangent bandage rests where the limb is narrow and semicircular rests where the limb fills the transverse space between the rods.

The Allen splint runs more or less parallel and close to the contour of the limb, providing semicircular support for all parts of the limb.

The upper end of the Thomas splint is a circle set obliquely. In use it is padded. But since there can be no true circular section of the upper thigh or hip, there are sure to be irregular pressure areas. True, there may be considerable pressure over the tuberosity of the ischium, also there will be considerable pressure and pain anterior to this point where the skin is more delicate and sensitive than the skin covering the face. It is also true that a round rod can be so padded that most of the pressure will be borne over ischial area. It is equally true that this same padding will slip around beneath the small steel rod. If the rod is equally padded on all sides then

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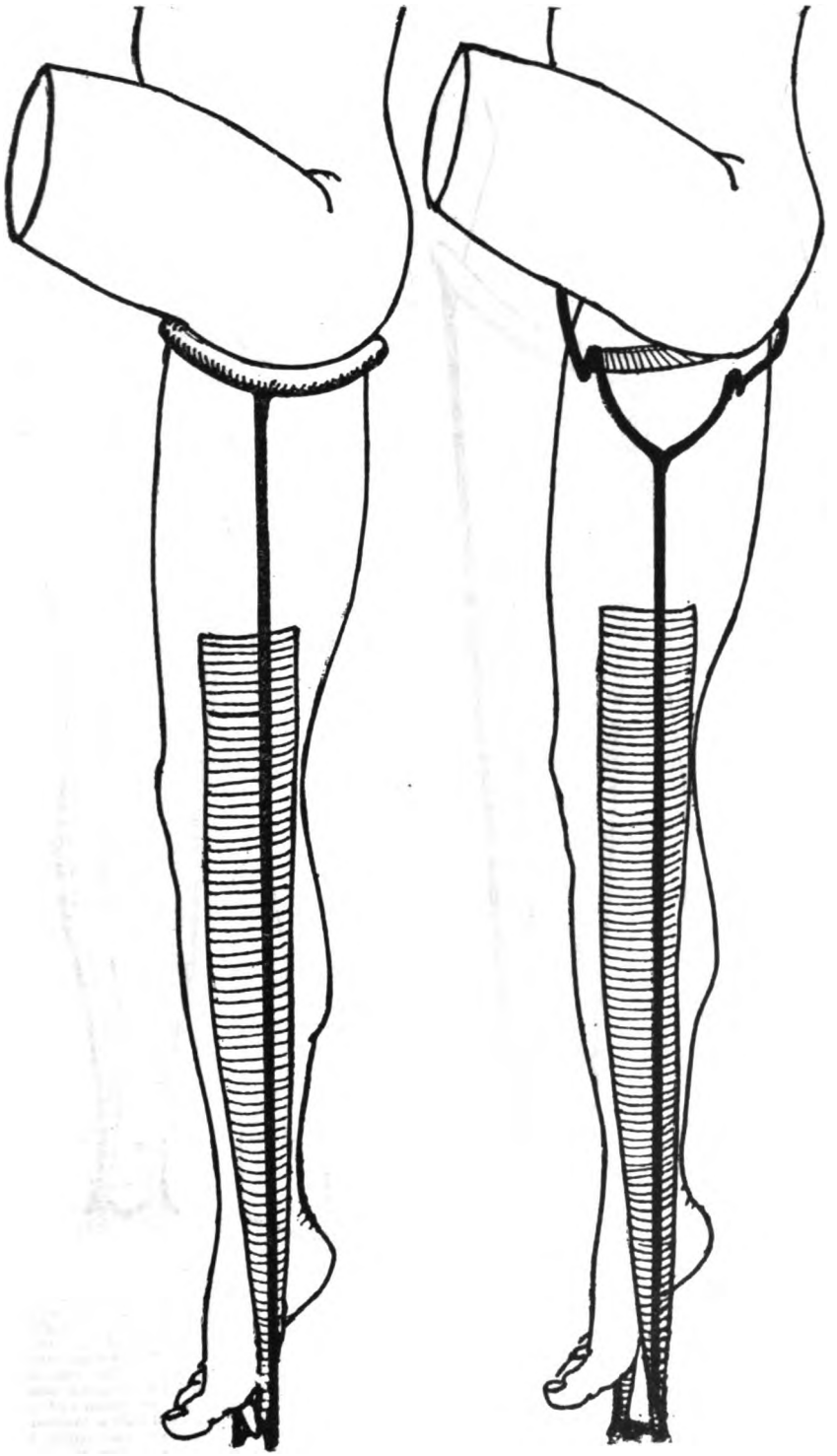

FIG. 1.—THOMAS SPLINT.

Showing circular pressure regardless of appropriateness of pressure-bearing areas. Also showing its encroachment upon the area about or covering the anus.

FIG. 2.—ALLEN SPLINT.

Showing the anterior portion of the crotch sling, departing from the sensitive area of crotch. There is no question about this splint freeing the sensitive areas not only from pressure but even from contact with pressure devices.

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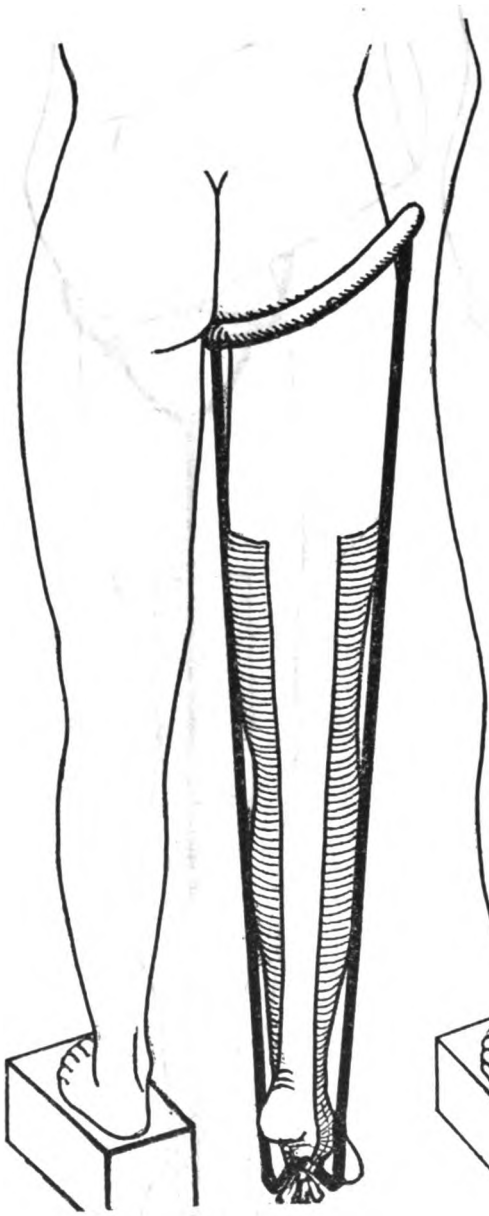

FIG. 3.—THOMAS SPLINT.

Showing encroachment or occlusion of area about the anus, also lack of conformation with the contour of the limb. It also shows the central notch beneath the foot for tieing the bandages, thus producing much or little lateral compression of the foot.

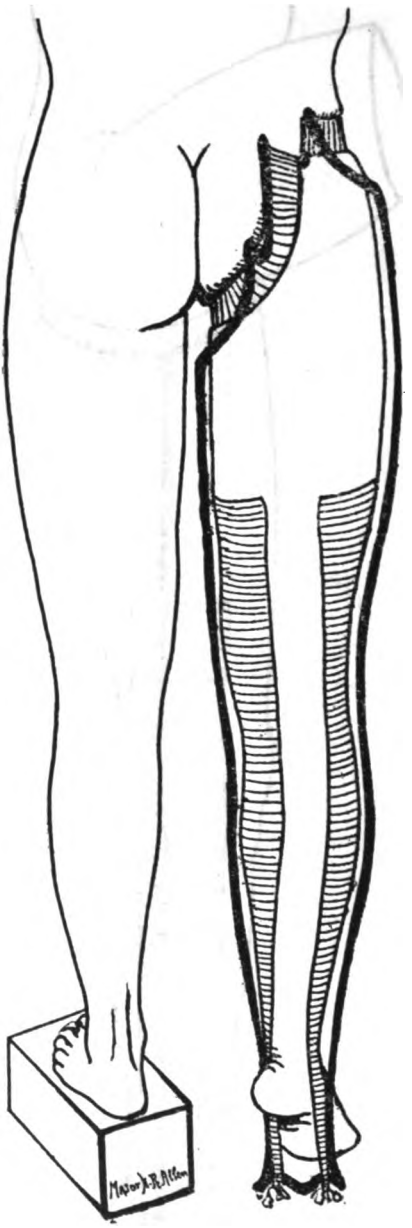

FIG. 4.—ALLEN SPLINT.

Showing area about anus free for sanitary possibilities and not encroached upon by the sling that is hooked high behind for ischial and gluteal bearing. The horizontal band or sling around the right ala prevents the round steel from bearing against the skin. The vertical rods follow contour lines making posterior bandages act as semicircular supports from end to end instead of half tangent and half semicircular bearings. Beneath the foot the splint is curved so that the points for tieing traction bandages afford direct pull without pinching the foot or pulling the adhesive plasters away from the ankle or leg.

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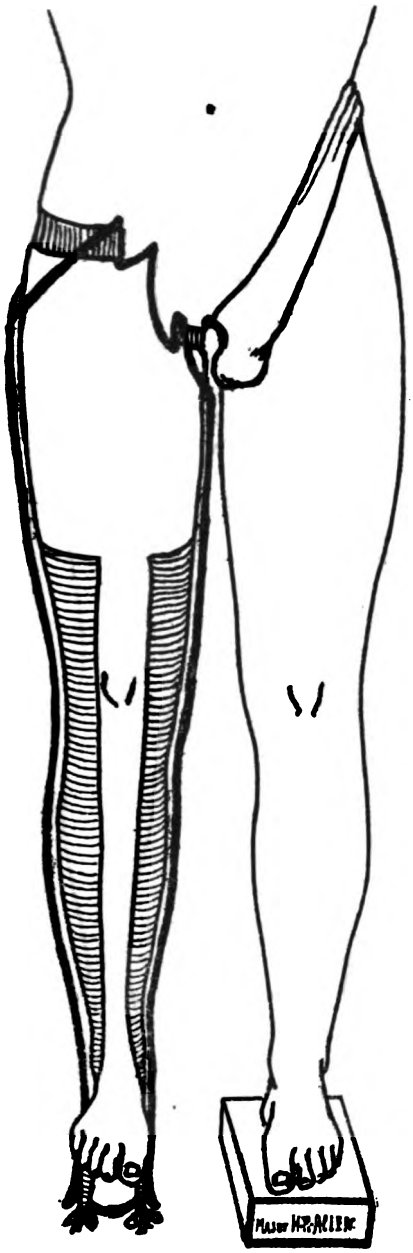

FIG. 5.—THOMAS SPLINT.

Showing encroachment on urethral area and upon sensitive area of crotch, also showing the tractor slings wound around the vertical rods and the necessity of a horizontal anklet to prevent pulling the adhesive plasters off from the ankle and leg. Lateral traction upon anklet is balanced by its fore and aft pressure upon tibia and tendon Achilles, which is very undesirable when continued for a few weeks.

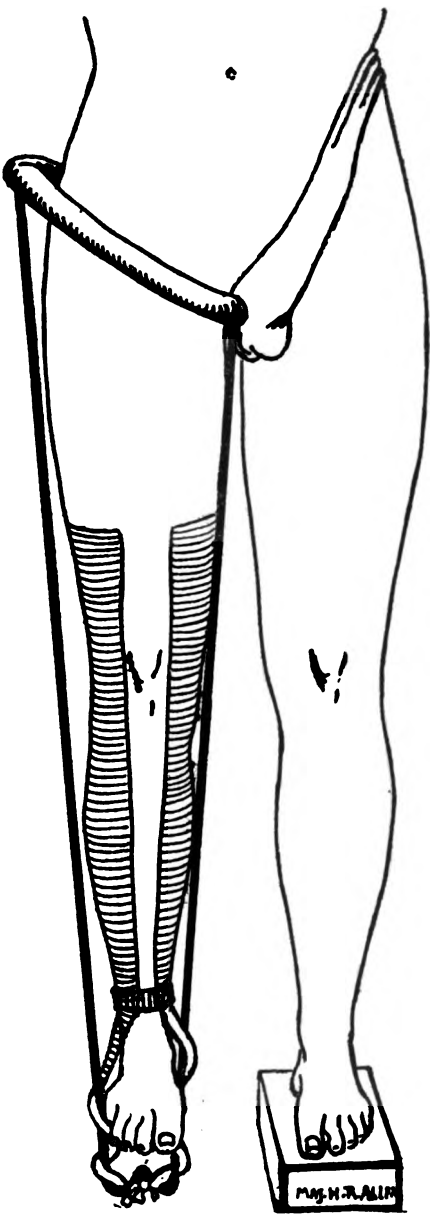

FIG. 6.—ALLEN SPLINT.

Held away from ilia, absence of pressure or even contact with urethral area. The crotch sling is hooked low in front to make this sling leave the ischial bearing area at a tangent and prevent pressure or contact against the sensitive area of the crotch. Contour of limb is followed by vertical rods. Traction is made direct from area drawn to point of attachment as it should be.

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FIG. 7.—ALLEN SPLINT.

Showing the method of making oblique traction on an injured lower extremity by a sling passing over the tuberosity of the ischium of the opposite side, useful in cases requiring abduction of hip joint, or in other cases where it is advisable to use the opposite ischial bearing. (Rear view.)

FIG. 8.—ALLEN SPLINT.

Showing the method of making oblique traction on an injured lower extremity by a sling passing over the tuberosity of the ischium of the opposite side, useful in cases requiring abduction of hip joint, or in other cases where it is advisable to use the opposite ischial bearing. (Front view.)

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the anal area is encroached upon if not completely covered. The enormous popularity and great number of these Thomas splints now in use merely accentuate our woeful lack of correct basic mechanical principles.

No one would think of punishing a saddle-horse by using a padded steel girth to hold the saddle on. A flat flexible girth adapts itself so instantaneously and accurately to the contour of any shaped horse that it is universally used. Referring to Figs. 2, 4, 6, it will be observed that with all its little kinks and bends, the Allen splint is bilaterally symmetrical and one splint is equally appropriate for right or left side. A soldier's belt is long enough for the crotch sling, and the sling over the wing of the ilium, preventing the round steel rod from causing pressure, even when the leg is abducted. By throwing the bends across to the opposite side, a very good ischial pressure can be secured on the side opposite the limb under treatment. I believe that the Allen splint is more appropriate mechanically, more comfortable under light and heavy duty and costs no more, and is altogether more efficient than the Thomas splint.

TECHNIQUE FOR DETERMINING THE SIZE, SHAPE AND POSITION OF EMPYEMA IN THE CHEST CAVITY

By First Lieutenant THOMAS RICHARD SEALY, M. R. C.

(With two illustrations)

It is an accepted fact by most all clinicians that the only pathognomonic sign of empyema of the chest is the obtaining of pus through the exploratory needle and when pus is thus found as much is drawn out through the needle by aspiration as it is convenient to do; it not being necessary to draw it all out as the solution described below mixes well with the pus.

The amount drawn out by aspiration is carefully measured and the solution is injected through the same needle and tube, by a "Y" glass connection tube placed between the aspirating needle and aspirating bottle, one limb of the "Y" being attached to the tube connecting with the aspiration bottle and the other to a rubber tube 30 cm. long, the other end of which is attached to a small glass funnel (Fig. 2).

Through this funnel is poured the solution which has been warmed to body temperature and the amount thus introduced must not exceed the amount of pus which has been withdrawn. A hemo-

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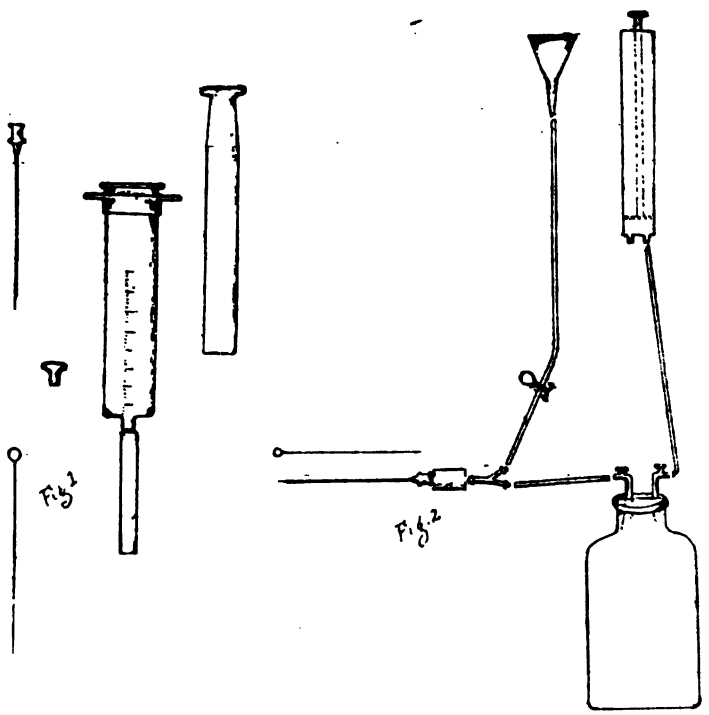
static forceps is applied to the tube leading to the funnel during the aspiration and is removed and applied to the tube leading to the aspiration bottle while introducing the solution into the cavity.

The aspiration and injection may also be done by attaching a rubber tube 5 cm. long of heavy rubber to the shank of the exploratory needle and the other end to a slip joint socket into which is inserted the tip of a glass aspirating syringe of 20 to 30 c.c. capacity which has a ground glass piston (Fig. 1). Then draw



out the pus and when the aspiration is complete the slip socket is plugged with a rubber stopper and the syringe which has been removed is replaced by another sterile syringe which will fit the socket; using this syringe to inject the solution very slowly. The syringe used for the aspiration may be used for the injection by sterilizing it with a 10 per cent solution of phenol and rinsing with sterile water. If the amount of the solution injected into the cavity does not exceed the amount of pus withdrawn there will be no increase of pressure in the empyema sac or cavity.

This solution as introduced into the empyema sac is prepared in

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the following manner: To 250 c.c. of mucilage of acacia add 25 grams of barium sulphate or barium carbonate. To this add 250 c.c. of saturated solution boric acid and shake thoroughly.

When the proper amount of this solution has been passed into the pus cavity the needle is then withdrawn and the patient promptly taken to the X-ray where plates are made and fluoroscopic studies done.

The solution described above is non-poisonous and has been left in a patient's empyema sac (cavity) for more than twenty-four hours without causing the slightest untoward effect. There was no change in pulse, respiration or temperature.

It produces under the X-ray such a perfect shadow of the cavity injected that by reading the plates a surgeon can determine positively the size, shape, depth and position and most dependent part of the empyema sac in the chest cavity.

Empyema in the chest is sometimes multiple, and the cavities may connect by small straits. As the solution mixes readily with the pus, it might also show them.

The solution should be prepared fresh each time it is expected to be used. All of its components being inexpensive, no special economy is necessary.

The aspiration and injection is done in an aseptic manner, and the component parts of the solution are sterilized previous to its preparation.

The same results are obtained by the use of bismuth subcarbonate instead of the barium salt, but as it takes more of the bismuth subcarbonate it might act as a foreign body in the pleural cavity.

Some of this solution, as prepared by the above formula, was swallowed by the writer to prove that it would cast a shadow and was non-poisonous, before it was used in the pleural cavity of man. No untoward effects were experienced.

It is the opinion of the writer that if this solution be mixed with milk it might be useful in gastrointestinal work.

It is also suggested that it might be injected into "cold" abscesses and fistulous tracts to determine the size, course and origin.

There being no developing work done at this hospital, we cannot supply prints of the plates made before and after the injection, but we have some excellent plates that prove the efficiency of the technique.

We realize that there is much yet to be done in perfecting this technique.

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March 15, 1918, a patient, Private William E. King, Company C, 106th Engineers, who had his empyema cavity aspirated (right chest) and about 400 c.c. of pus withdrawn then, the same amount of the solution described above was immediately injected and the patient taken to the X-ray, where plates were made and fluoroscopic studies done.

The X-ray showed a cavity extending from the first rib to seventh intercostal space, and the most dependent part to be in the anterior axillary line and localizing the empyema sac perfectly.

On March 16, 1918, at operation, under local and very light ether anesthesia, about 1 inch of the sixth rib in mid-axillary line was removed and the pleura opened with escape of several ounces of seropurulent fluid.

The patient's temperature and pulse have been normal ever since the operation (five days ago).

THE MULTIPLE SHELF INCINERATOR

DESIGNED BY MAJOR CHARLES SPENCER WILLIAMSON, M. R. C., U. S. A.

From the Medical Officers' Training Camp, Fort Riley, Kansas

(With five illustrations)

In view of the very large number of incinerators of all types which have been designed and used with varying degrees of success, it would seem almost an impertinence to design a new one. A little analysis of the situation, however, discloses that the very fact that we have so many shows that none of them is entirely satisfactory A rather intensive study of the merits and demerits of the various types showed very plainly that the great majority of those in use required such large amounts of fuel as to make their use almost prohibitive under the conditions of the present war. A remark of Surgeon General Gorgas at the time of an inspection of the Fort Riley Sanitary Laboratory, to the effect that what was needed was "a fireless incinerator" set the writer to thinking of a design which above all other things would use the minimum of fuel. This apparatus was built at first of an experimental size, then later in what is called the standard size, and with these two models we have experimented during the past winter, until we have finally reached a point where we feel justified in recommending it as a practical, easily built and, substantially, "fireless" incinerator, since it *requires no fuel after the initial charge, provided it be kept in constant operation.*

The incinerator consists essentially of a rectangular brick chimney, 4½ by 6 feet inside diameter, with a grate and above this grate a series of six drying shelves, arranged in zigzag fashion, as

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baffle plates, and overlapping each other in such a way that they close off the entire cross-section of the chimney excepting for a slit one foot wide along the longer side. This arrangement, as will be seen at a glance from the side elevation, has the effect of causing the heat to be deflected alternately from front to rear.

We have experimented with various numbers of shelves, but for an apparatus of this size, six is found to be the best, since, when properly operated, but little heat is wasted, yet the apparatus is kept within reasonable bounds of simplicity. The garbage is thrown in at the top of the stack, which is 12 feet high, and then pushed down from one shelf to the next lower one by a long-handled hoe or rake, which is inserted into the stack through the two small doors just above each shelf. In this way it is thoroughly and yet gradually dried until when it reaches the lower shelf it is practically ready for combustion. After a short stay on this lower shelf it begins to take fire, at which point it is pushed off the lowest shelf, which extends only to the middle of the stack, on to the fire on the grate bars below, where it promptly takes fire. *From this point on no further wood is used, since the burning garbage furnishes much more than sufficient heat to incinerate itself.* The apparatus is started by loading all the shelves with a thin layer of garbage, not to exceed 1 or 2 inches in depth, building a fire under the lowest shelf which is continued until the garbage on this shelf begins to catch fire, when it is pushed into the flames and the fuel consumption is then at an end.

It should be emphasized that all of the fuel to be used should be put on at the very beginning and it should be of a quickly inflammable nature. We have used old boxes, odd pieces of 2 by 4, and split cord wood. Two hundred pounds is the smallest amount with which we have been able to start the apparatus with a satisfactory degree of speed. While it doubtless could be done with 50 pounds less fuel it is not worth while to make the attempt unless the scarcity of fuel is really acute. While the operation of the apparatus is simplicity itself, when once seen, there are several points which need emphasis. One is that the garbage on the lowest shelf should never be pushed down on to the grate bars until it commences to take fire, because, if this is done, the fire will certainly be smothered. In starting the operation it is important to acquire a bed of hot coals, so that the garbage will catch fire almost instantly upon reaching the grate bars. As fast as each shelf is emptied, the material on the next higher shelf is pushed down upon it and more garbage put in at the top. For convenience, the stack

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is provided with a wooden platform and a pair of steps, which aid in loading and in tending the upper shelves.

Inasmuch as the volume of the garbage is greatly diminished by the evaporation of the water, a layer 4 inches thick on the top shelf will scarcely cover one inch by the time it reaches the first shelf. The immense amount of water evaporated is readily seen by the amount of steam which is given off at the top of the stack. It is convenient to build the stack in a small hill, as shown in the picture.

In all of the experiments which have been done during the past winter with this apparatus, there has never been the slightest difficulty in consuming the garbage with this minimum amount of fuel. The only difficulties which we have met, and which we feel that we have now overcome, have been to find materials capable of withstanding the intense heat, and yet which were readily obtainable under the ordinary conditions of warfare. We have held many consultations with engineers of recognized ability, but found that even they were able to form but a very imperfect idea of the great heat generated by the combustion of the garbage. On being assured that cast-iron grate bars, used as supports for the shelves, would certainly withstand a very much greater heat than a little home-made furnace of this sort could possibly produce, we obtained a half dozen pairs of these and found that they did not even survive one trial. Iron pipe, while much better than cast-iron bars, is still not strong enough for this larger model.

We finally adopted wrought iron or steel wagon tires. The melting point of wrought iron is much above that of cast iron and it retains its strength quite satisfactorily at a cherry red heat. The shelf supports in the apparatus we have were made by taking wagon tires, straightening them, cutting them to the proper length, placing from three to six of them side by side with a thin washer between and bolting them together at three or four points. A composite bar of this sort will, even when heated to a fairly bright red, stand up very well under the weights which it is called upon to support. Inasmuch as one of the bars may be taken out and replaced in perhaps three minutes without removing the shelf which it supports, by simply lifting up the shelf by hand or with a lever, and since it can be replaced in an inverted position, it is a matter of no consequence if, because of the fire getting too hot, one of the supports should sag a little, since this replacing it upside down will cause it to resume its original form in the event of its sagging a second time. A good deal of experimentation leads us to prefer boiler

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plates of a thickness of three-sixteenths to three-eighths inch, since this will stand up very well without more than an inappreciable degree of buckling and may be taken out very readily and straightened out with a sledge-hammer in a half-hour's time.

There is another advantage in not having the shelves too heavy, namely, that they are readily obtainable without being specially made. The shelves in our apparatus are made from scrap steel plate which came from an old tank and at the present writing, April 4, 1918, we have incinerated approximately 60 tons of garbage and have experimented with a number of loads of manure as well, and all this time the plates have not required straightening. The grate bars are, like the shelves and shelf supports, readily removable, since they are merely laid on a brick ledge and are separated from each other by bricks laid on edge. It will be noticed from the plan of the grate that we use alternately large and small pipe. This is done so that when burning garbage with the small pipe in position the space between the grate bars is only a half to three-quarters of an inch, whereas, if manure is to be burned, the small pipe is to be removed so as to give wider grate openings. The apparatus is not designed primarily for manure, although this may be burned satisfactorily in comparatively small quantities if moderate quantities of fuel be used.

Certain points in construction should be noted. In order that the shelves may be easily removed, they are merely laid on the supports and not fastened in any way. At least an inch should be allowed for expansion. On three sides the shelves are supported by bricks inbedded in the walls and, in addition to these, two of the iron shelf supports already referred to support the shelves at the third point. These shelf supports are not fastened in any way, but one end rests in a blind recess in the wall, and the opposite end in a narrow slit-like opening left in the wall about the size of a brick placed on edge. This opening is merely closed by a loose brick imbedded in clay, so that it may be knocked out without disturbing the integrity of the wall. To prevent the weight of the shelf supports from breaking the brick, it is desirable to place a plate of iron under each slit. For this purpose a tie plate, such as can be found around any railroad, is very satisfactory. The fire door is made of two layers of thin sheet iron with asbestos in between. It may, of course, be made of heavy iron, but this is not necessary. We have found the best method of securing it is by taking two strips of wagon tire and bolting these through the wall by means

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of three eye-bolts, which can be made in a few minutes by any blacksmith. These three eye-bolts make a satisfactory hinge.

In the construction of the stack the entire lining should be of fire brick, since ordinary brick will not withstand the intense heat for any great length of time if the incinerator be kept in operation. It should be again emphasized that, when properly constructed, this incinerator leaves little to be wished for as a means of disposal of solid garbage, and the only difficulty we have met is that of keeping the fire from running away. It is for this reason that we use check draft doors so that, when the first tinge of red color is seen in the plates, the draft can be checked down to prevent the shelves and supports getting too hot. It is evident that the greatest heat will be on the two or three lower shelves, and for these shelves we make the supports at least twice as strong as for the upper ones. Practically what we have done is to bolt together as many tires, with a thin washer between, as we can squeeze through the opening left by the brick removed.

The capacity of this incinerator depends of course upon the kind of garbage used, the amount of water it contains, and to a still greater extent upon the temperature with which it is worked. A large amount of experimentation leads us to regard the normal capacity of this sized apparatus to be 10 to 15 tons in twenty-four hours. We have never succeeded in accumulating in this camp a sufficient amount of garbage to run the apparatus for more than twelve hours, but a record of one or two of the trials may be of interest. On the occasion of the inspection of this camp by Colonel Munson in March of this year, we burned, as a demonstration of the apparatus, approximately 16,000 pounds of garbage in four hours and fifty-five minutes from the time the wood was ignited, to the time the last bucketful was thrown into the incinerator. The fuel used was 200 pounds of wood. It is only fair to state, however, that such a high rate of speed is likely to let the apparatus get out of hand and become too hot, if not under skilled supervision. On another trial we burned 19,013 pounds of garbage in eleven hours and twenty-three minutes, using 200 pounds of wood to start with, and none thereafter. The garbage was accurately weighed just before placing in the incinerator.

It is very evident, from the fact that the apparatus is absolutely self-supporting after the initial charge of fuel, that the economical way to run it is to keep it in continuous operation. We would therefore strongly urge that if this apparatus be used for, let us say, a division or an army cantonment producing 15,000 or 20,000

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pounds of garbage per day, this weight being reckoned after draining off the water, that the burning of this amount be extended over the twenty-four hours, since in this way fewer men are required, the apparatus is not subjected to the risk of being overheated, and above all no fuel is used after it is once in operation. For example, in burning 9 or 10 tons of garbage daily it will be better to carry on the operation at a rate which will require twenty-four hours to finish the combustion and then to start with the new day's supply. The writer believes this apparatus adequate to take care of the garbage of a division and even more, if run through the entire twenty-four hours. Through the courtesy of the reclamation officer at Camp Funston, Lieutenant Larrieu, we have had the garbage at Camp Funston with the remount station and the various civilian organizations, being all the organizations at this camp, with the exception of one detention camp, accurately weighed. The date chosen was Easter Sunday, since on a holiday of this sort, the garbage is usually at its maximum. The amount for the twenty-four hours was 18,023 pounds so that this apparatus has in less than twelve hours actually consumed more than the amount of garbage produced at Camp Funston. Since the entire cost of the apparatus is so small as to be negligible, where a division is concerned, it would be advisable to have two, the second one to be used in the event of a breakdown, although since the brick work is very unlikely to be damaged it is a very simple matter to have extra shelf supports and shelves at hand, and it is a matter of not more than a half-hour to remove all the shelves and another half-hour suffices to replace them.

It will be evident that in view of the inexpensiveness of this apparatus, it may be readily installed in camps, cantonments, base and general hospitals, etc. Since the fuel consumption is nil, it may be used with smaller sized organizations with profit. Since its capacity in twenty-four hours is greater than is likely to be needed, there is always a safe margin of capacity for additional garbage.

We have had no difficulty in disposing of feces in this incinerator by mixing them with approximately the same weight of garbage. The odor is much less than when burning the latter alone in other incinerators. We have not been able as yet to secure feces in quantities above a thousand pounds, but on that trial no difficulty was experienced.

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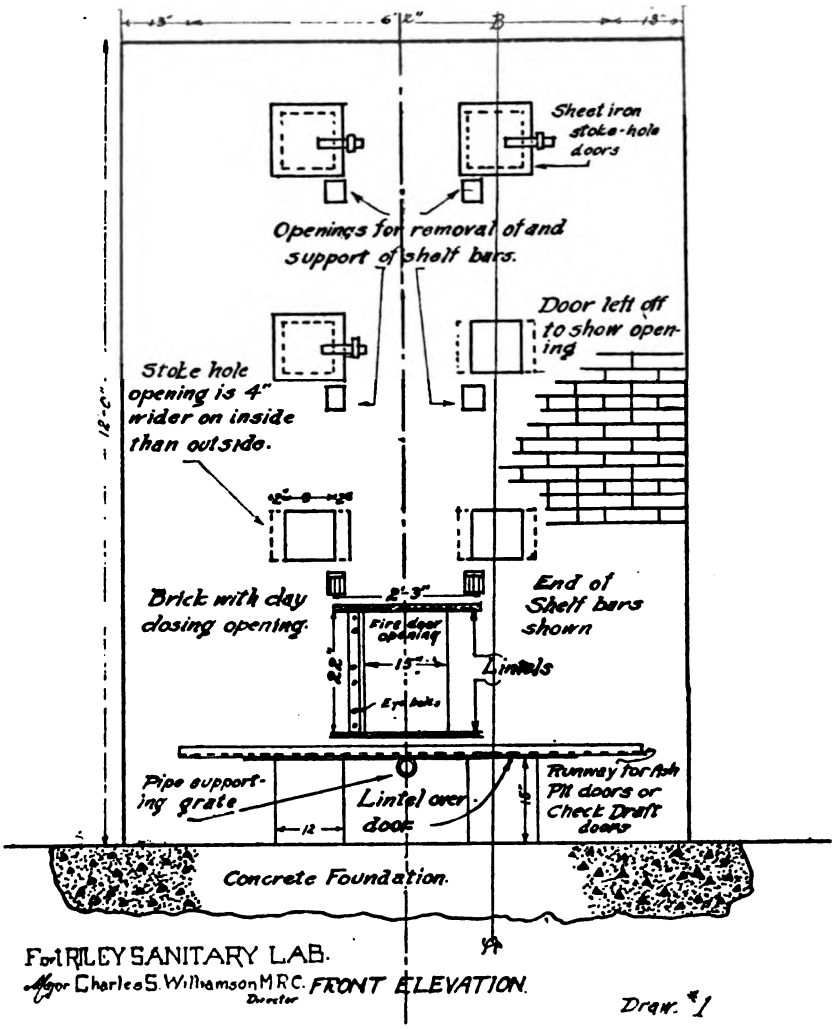
Sheet iron stoke-hole doors
Openings for removal of and support of shelf bars.
Door left off to show opening
Stoke hole opening is 4" wider on inside than outside.
Brick with clay closing opening.
End of Shelf bars shown
Fire door opening
Lintels
Eye bolts
Pipe supporting grate
Lintel over door
Runway for ash Pit doors or Check Draft doors
Concrete Foundation.

Fort RILEY SANITARY LAB.
Major Charles S. Williamson M.R.C. FRONT ELEVATION.
Director

Draw. #1

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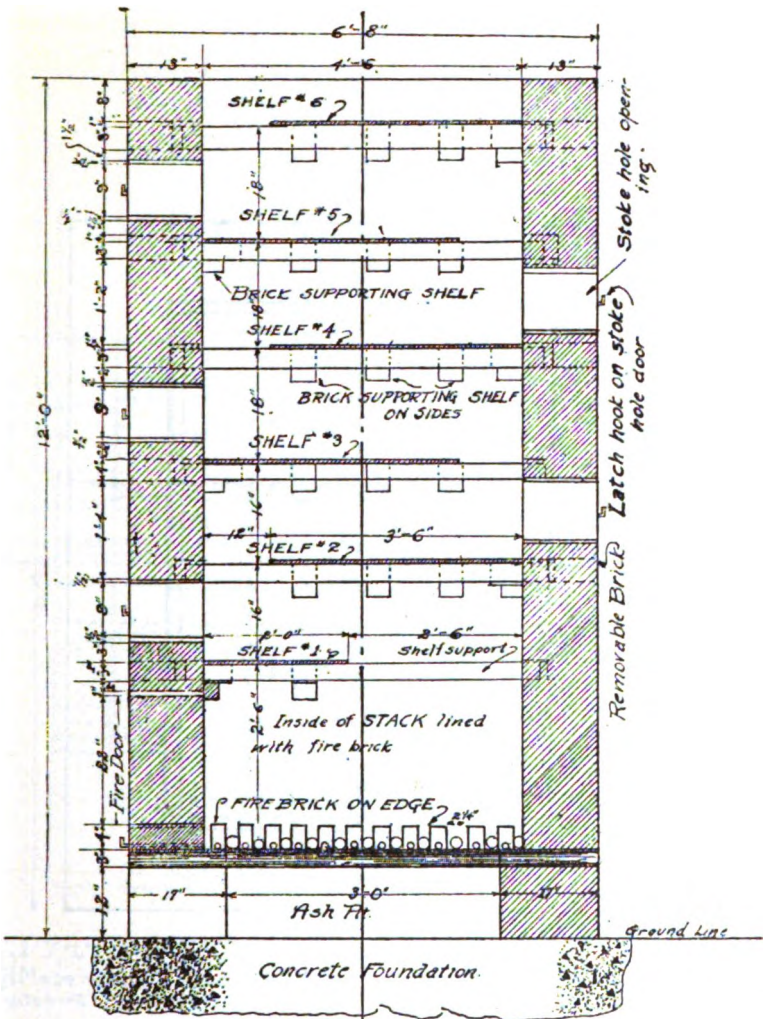

Fort RILEY SANITARY LABORATORY

CROSS SECTION THRU-A-B of DRAW #1

Major Charles S. Williamson. M.R.C. Director

Draw. #2

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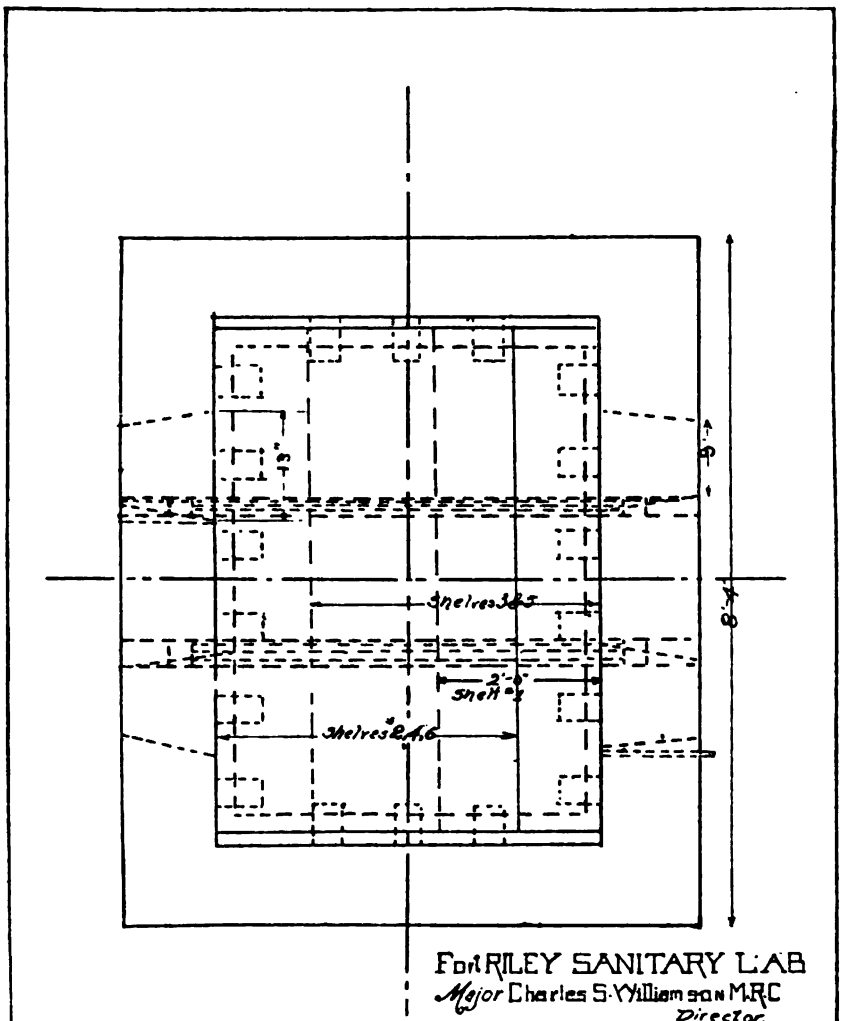

Plan of stack above Grate.

Draw #3

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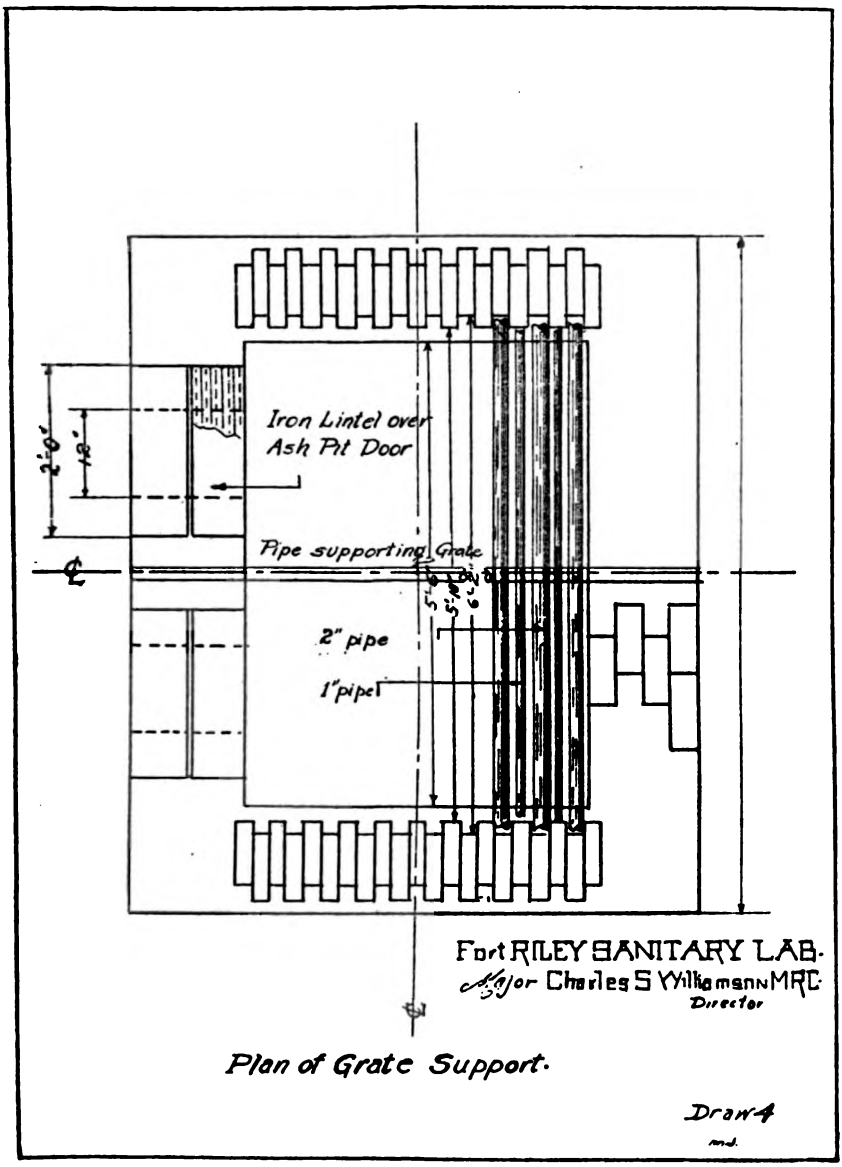

Plan of Grate Support.

Drawn
md.

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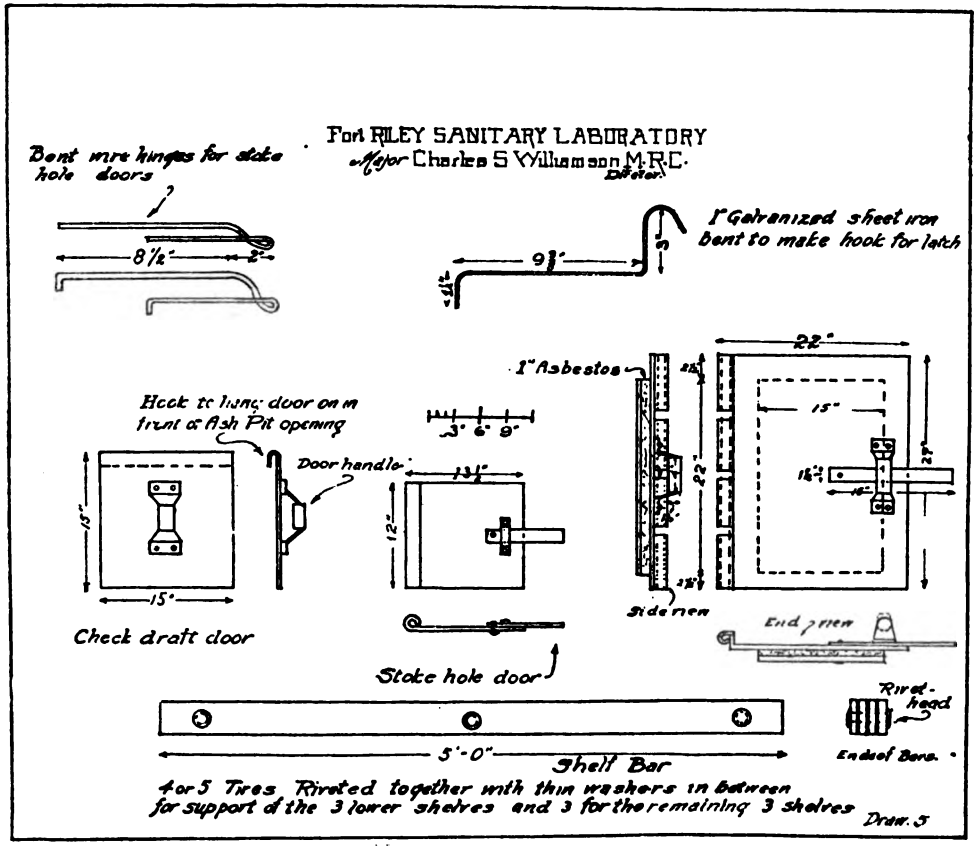

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CORRESPONDENCE

(With two illustrations)

To the Editors of "The Military Surgeon":

Your comments in the March number of THE MILITARY SURGEON, upon the letter of Major D. R. Lucas, M. R. C., have encouraged me in the effort to substitute metallic containers for the latrine purposes described in THE MILITARY SURGEON of January, 1918. It appears to me that your "hope that the time is not far distant when the so-called box latrine shall be wholly abolished in our service" must soon be realized by the exigencies of the present mode of war-

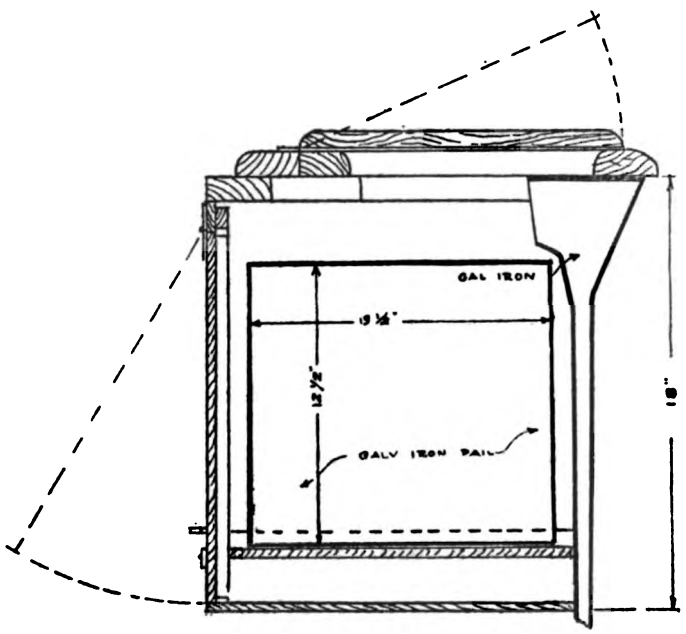

FIG. 1.

fare. The following may hasten this much to be desired consummation:

In lieu of Fig. 6, page 81 of the January number, which, by the way, should be corrected to appear like Fig. 1 here, I propose to substitute a strong galvanized garbage pail with self-closing lid. A urinal like the subjoined F is secured to the anterior portion of the pail in which an opening sufficiently large for the purpose

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has been previously cut. The bottom of this urinal which is spout shaped is 4½ inches from its upper border, and is provided with a coarse wire screen W—N to prevent stoppage by paper, etc.

From the latter a one-inch galvanized iron tube F passes into the urine soakage pit. The lower border of the opening in the anterior portion for the urinal is 4¼ inches. The wired bottom of the urinal is therefore half an inch below this line. The distance from the upper edge of the urinal to the point at which the feces bucket is attached is 4¼ inches. The posterior diameter of the urinal at the bottom is 3½ inches. The feces pail A fits snugly to the posterior border of the urinal. In order to prevent its receding a semicircular clip D is secured to the anterior upper border of the feces pail. This clip is loosely hooked over the lower edge of the opening in the pail. Care must be taken, however, that the feces pail is not held *suspended,* but that its bottom rests firmly on the bottom of the container. The antero-posterior diameter of the container is 15¾ inches. The depth is 14 inches.

The inside diameter of the feces pail A is 11½ inches at the top and 11 inches at the bottom. It is sufficient to contain the excreta of 100 men. Smaller containers and smaller pails may be used if so desired. In fact, the size and shape of the entire apparatus may be guided by available pails.

The self-closing lid C is strongly secured to the posterior border of the container and when dropped covers the entire container, including the urinal, protecting it against flies. There is no seat, the intention being that it should be used in the squatting posture. The container being buried half its depth or more during use, need never to be moved unless the trench is abandoned. The upper border of the container is strengthened by a wire hoop which also gives a rounded edge, so that it may be used as a seat in the event of its being used above ground. While this arrangement does not afford the acme of comfort it certainly is not distressing nor extremely uncomfortable, during the short time occupied in the act.

It would have been preferable to dispense with the container but it appears impossible to secure the urinal in the exact position required without it; moreover, leaking upon the soil would be impossible to counteract, whereas leaking into the metal container could be neutralized by disinfectants and cleansing. If used in the submerged manner it were well to give the outer surface of the bucket a water-proof covering to insure longer usage.

Major Daniel Lucas, M. R. C., Surg. 70th C. A. Regt., Fort Hamilton, to whom I am indebted for much assistance, has informed

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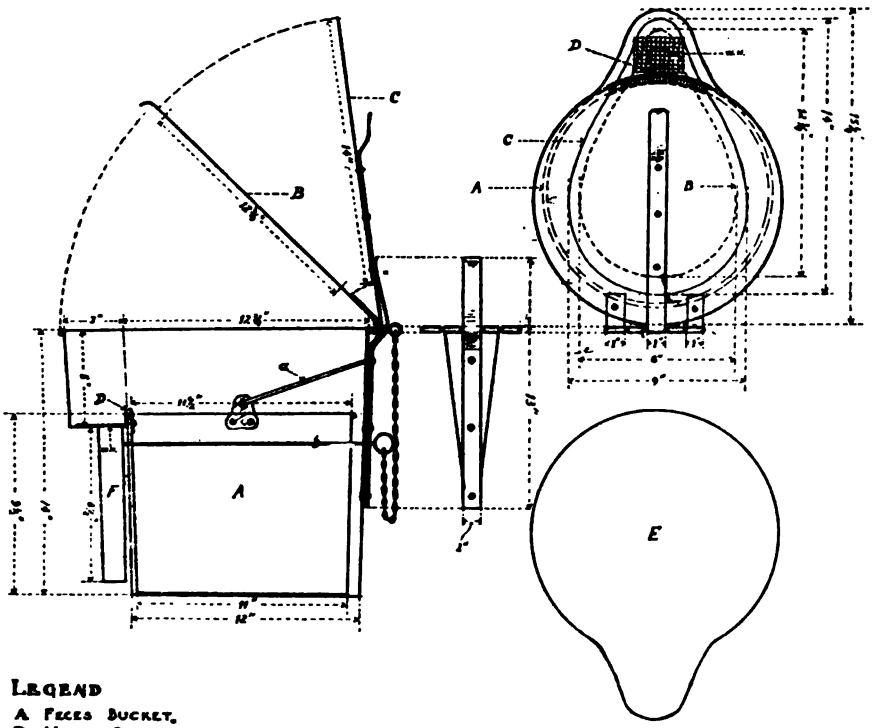
me that despite all precautions it has been difficult, in his many years experience as a medical officer in the National Guard to meet the repugnance of soldiers to sit upon any wooden seats previously occupied by others, and that he has met many violations of orders to avoid squatting upon the latter. My device would appear to meet these objections, either in the case of its use above or below ground level.



LEGEND

A Feces Bucket.
B Metal Seat
C Cover For Feces Bucket
D Clip To Hook Feces Bucket Over Lower Edge Of Opening
E Cover For Squatting Latrine
F Urinal
WN Wire Netting
a Handle Of Feces Bucket
b Wire To Deflect Feces

Baruch's Improved Metal Latrine For Trenches

Major Lucas, who has courteously been carrying out some experiments for me at Fort Tilden, has discovered that the pyramiding, to prevent which I devised a wire on page 81, January, 1918 number, may be prevented by adding a small quantity of kerosene as a deodorant, which facilitates the spreading of the mass without unduly increasing the bulk. However, a stout wire B drawn through

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the container and pail will deflect feces from center. It is withdrawn before removing the pails and replaced in the fresh pail. To prevent its loss it is secured by a chain when withdrawn. While this complicates the device it would certainly increase the pail capacity one-third by preventing the pyramiding of the center of the mass *as has been ascertained by experiment.* During use of the pail its cover should be suspended from the bar which serves as the lid stop. When the pail is removed the cover is replaced to prevent access of flies during carriage to the disposal pit. The principle, of separation of the liquid from the solid excreta, was illustrated in the January number of THE MILITARY SURGEON, in which it was pointed out that this separation greatly diminished the necessity of emptying the bucket, thus avoiding frequent carriage and exposure to the enemy's fire. This principle may be carried to a more efficient point by digging the urine soakage pit behind but near the trench, so that a *wall of earth three or four feet in thickness may intervene,* to prevent the intermingling of rain-water in the trench by soakage with the contents of the pit. A 1½ inch or larger tube or wooden box should rise from the bottom of the urine pit to a sufficient height to receive the tube of the urinal.

Since the device described above cannot fail to conduce to comfort, safety and freedom from vermin or other contamination, the expense, transportation and trouble of arrangement would be amply compensated in all but temporary trenches.

In Fig. 2 is shown a container with metal seat which stands upon the level of the bombproof.

I approve of the squatting posture because I have seen it practiced satisfactorily by thousands of soldiers during the Civil War. For those who may object to it I have devised the same container with a metal seat and self-closing lid as an illustration in Fig. 2.

This pail may be used like the other for the squatting posture if it is partially buried.

When practicable it may be well to dig a urine pit several feet from the trench and lead the urine through an inch or larger pipe to the pit. Of course this would not be feasible in low ground. But it would insure more perfect soakage and the probable intermingling of urine and rain-water in the trench proper would be obviated.

The lining of the pail with wrapping paper, recommended in my article in the January number of THE MILITARY SURGEON has been given a fair trial by Major Daniel R. Lucas, M. R. C., at Fort Tilden. He reports that

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First. The soft paper lining did quite well. The whole mass turned out of the bucket easily, leaving it unsoiled, save for a little moisture (he used kerosene). By this experiment I am encouraged to believe that newspaper will suffice if used in several thicknesses.

Second. The heavier paper worked much the same as the lighter; that is, it was moist throughout, but did not break.

Third. From the data which we obtained the average solid excreta for one man in twenty-four hours was 175 grams.

The latter statement agrees with my previous calculations.

Major Lucas used a light wrapping paper instead of cardboard for the bottom, also.

I have received the following report on my device described in the January number of THE MILITARY SURGEON from Col. P. M. Ashburn, M. C., who had directed the Sanitary Laboratory at the Medical Officers' Training Camp at Fort Riley, Kans., to construct it from the description given in that issue and report thereon:

The apparatus referred to in the article has been constructed and studied. The conclusions reached are as follows:

The apparatus will functionate satisfactorily and will separate feces and urine. The use of the tube leading into the soakage pit is not satisfactory, since the tube is likely to be injured.

(Signed) CHAS. SPENCER WILLIAMSON,
Direction, Sanitary Laboratory.

Applying this statement to my stationary device on pages 81, 82 and 83 of the January number, I would say that the principle of separation of solid from liquid matter being satisfactory to the reporter and the liability of the tube to be injured depending upon the material of which it is constructed, I hope that it may be adopted by the Surgeon General, whether a wooden container or the metal one above described be preferred. Moreover, the tube may be additionally protected in the wooden containers if arranged as in the following diagram, which provides for its position within the box:

Yours very truly,

SIMON BARUCH, M.D.

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ORIGINAL ARTICLES

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HOW THE UNITED STATES IS MEETING THE TUBERCULOSIS WAR PROBLEM[1]

BY COLONEL G. E. BUSHNELL, U. S. A., RETIRED

JUNE 6th marks the anniversary of the day upon which the tuberculosis work of the Surgeon General's Office may be said to have begun. The National Tuberculosis Association had already recommended that the army should be reëxamined for tuberculosis. This recommendation carried much weight, of course, but it could not be said that the practical steps necessary to effect the reëxaminations were begun until that date. There is, therefore, a peculiar appropriateness in reporting the results on this day and before the members of this Association.

The work was initiated among many difficulties, the Surgeon General's Office was in a state of flux, undergoing an unheard-of expansion, as may be understood when it is said that 118 officers were brought in where there had been perhaps half a dozen before the war. The Division of Internal Medicine, new created, with the tuberculosis work as its first nucleus, has been moved four times, the greater part of the Surgeon General's Office has occupied three different buildings during the year, the work of the tuberculosis section of the Division of Internal Medicine, like that of the other sections of the same division, had to be done with the aid of entirely untrained clerks and at first without assistance from other medical officers. But the greatest difficulty of all was the slowness of response on the part of the profession. It seemed at one time that the plan must be given up for lack of examiners. However, with the very generous aid of many of the leaders of the medical profession, a corps of examiners was slowly brought together. Most of these examiners had the personal endorsement of the teaching staff of the great medical colleges; some were themselves teachers.

[1] Read at the annual meeting of the National Tuberculosis Association.

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Of course, in so large a body—at one time there were nearly 400 examiners for tuberculosis—there were differences in capacity and in adaptability, but in very few cases was it found that the endorsement had been unwise. One of the first steps was the issuance of an order by the Surgeon General's Office, S. G. O., No. 20, intended to standardize the methods and the indications in order to secure, as far as might be, uniformity in practice. As I pointed out at the North Atlantic conference last fall, military examinations must differ from those of civil life in three respects: first, the statements of the men examined could not be taken at their face value, there might be an object in concealing facts when the soldiers desired to serve, as volunteers naturally did; there might even be a possibility that those who repented of their bargain might give a past history of tuberculous infection when none had existed—the examinations must, therefore, be based on objective fact. Second, besides the interests of the individual, only considered usually in civil practice, there must be borne in mind the interests of the Government. It was important above all things to obtain soldiers; men must therefore not be rejected on doubtful indications—the diagnoses upon which rejection was based must be based upon positive, distinctly marked signs and symptoms. Third, the examinations must be rapidly performed in order to clear the army of the unfit at an early date for the army's sake, and examinations must be early to prevent claims that the disabilities found had been incurred in line of duty—this for the sake of the taxpayer. These were novel ideas for our examiners, but they grasped them soon and carried them out loyally. The attempt to standardize indications was perhaps a bold one. Naturally, the ideas advanced in Circular No. 20, though before its publication it had received the approval of some of the leading internists in the country, did not fail to arouse some opposition, which cannot be said to be overcome even now. Almost any statement concerning a disease with regard to which such divergent views are held, as is the case with tuberculosis, will meet with some dissenters. Still I think it may be said that, though imperfect, a standard is better than no standard, under the conditions of this examination.

Now as to results. Were the examinations worth while? What were the facts as to the tuberculosis found? From examinations at officers' training camps in which 53,905 men were examined, 195 cases of tuberculosis were found, or .362 per cent; and of the aviation service, in which 38,835 men were examined with 62 cases of

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tuberculosis, or 0.159 per cent, were perhaps not worth while. These men were all picked men, the choice, physical specimens of the country, many of them college students and athletes. Combining these figures we have a total of 92,740, with 257 rejections, a percentage of .277. And it must be admitted that it is quite possible that some of these had really no active tuberculosis, no tuberculosis at all which deserved rejection. Several cases came to our attention in which we were obliged to admit that our examiners had been unnecessarily severe. If I may digress here for a moment, it is a most interesting question how many of the total number of 11,020 cases rejected for this cause had no clinical tuberculosis. That this constitutes a very real danger is abundantly shown by the experience in the French army, the facts concerning which I have detailed on so many occasions that I will spare you them at the present time. As for our own army, some light may seem to be thrown by the fact that of these 11,020 cases only 10,011, or 90.84 per cent, have actually been discharged to date. But of these in some cases the final papers have not been made out; other cases, instead of discharge, have been granted treatment at sanatoria. We cannot draw any safe conclusions from the fact that, of the 11,020 recommended, 1,009 have not yet been discharged. When we consider that to find 11,020 tuberculous subjects it was necessary to examine 1,406,498 men, with a total percentage of 0.783 per cent, it is seen that the menace to the individual command from the presence of tuberculosis is small. These figures agree singularly with those obtained from the regular army, in which 190,398 men were examined with the rejection of 1,444 cases of tuberculosis, or 0.758 per cent; and with those obtained in the examination of 40,396 men in the coast artillery corps, a branch of the regular army, with 297 rejections, or 0.735 per cent; both of these percentages—namely, 0.758 per cent for the regular army in the field, and 0.735 per cent for the coast artillery corps in garrison—being somewhat lower than the total percentage of 0.783 for the whole army examined.

In one respect the diagnosis of pulmonary tuberculosis at military camps is more difficult than it has ever been before, at least within the memory of men now living. As you perhaps know, there has been a really serious epidemic of respiratory affections due to a hemolytic streptococcus. The infection, beginning as a simple bronchitis, in the severer cases, soon invades the peribronchial tissues and becomes what MacCallum calls an interstitial bronchopneumonia. Recovery from this affection is slow; for months the patients are in poor

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health and the physical signs in their lungs and their symptoms, including hemoptysis, constitute a clinical picture quite indistinguishable from that of pulmonary tuberculosis. Large numbers of soldiers who had had this streptococcus bronchopneumonia have been classed as tuberculous and recommended either for discharge on account of pulmonary tuberculosis or for sanatorium treatment. The only reliable means of distinction between the two affections is the examination of sputum, and it has been found necessary to issue orders that no soldier shall be discharged for pulmonary tuberculosis unless his sputum is positive for the tubercle bacillus. This test is the more trustworthy because these bronchopneumonias resemble active and extensive tuberculous foci, a type of tuberculosis in which it is to be expected that tubercle bacilli will abound.

We have considered the possibility that too many men have been rejected. How about the other possibility that our examiners did not find all that they should? The tuberculosis specialists at the base hospitals of the national army camps report 4,020 cases of tuberculosis referred with 3,927 cases rejected, some of which were found, however, in the primary examinations; but others, the precise number of which is not known, were discovered after the men had been passed by the special examining boards. Some of the cases of this group are doubtless cases of streptococcus bronchopneumonia.

If it shall seem to some in reflecting upon these figures, obtained from total examinations and from those of the regular army, that examinations in which less than one man in a hundred was found to have, or, if you please, was even suspected to have tuberculosis, did not after all justify the time, labor and expense, what shall we say of the following results? At Camp Taylor, Ky., mostly occupied by the national army men from Kentucky and Indiana, 20,671 men were examined with 334 rejections, or 1.61 per cent. At Camp Kearney, Cal., to which camp was sent the drafted men from the southern Rocky Mountain plateau, Arizona, New Mexico and Colorado, as well as the National Guard from these states, there were found 953 cases of tuberculosis in examining 19,827 men, or 4.831 per cent. Manifestly many of these men must have been health-seekers, originally from other states. An examination of five howitzer companies at Fort MacArthur, Cal., found 103 cases of tuberculosis among 501 men examined, or 20.55 per cent. These companies were made up of drafted men from Texas. The examination was done by an excellent examiner, a member of our Association, who, in examining some other organizations, found no tuberculosis

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at all. Evidently not all examining boards in Texas have done their duty. In the National Army encampments the boards of fourteen divisions report a total of 361,314 men examined, with the detection of 2,435 cases of tuberculosis, or 0.673 per cent. Camp Taylor, with its percentage of 1.61, is the worst camp. The best is Camp Sherman, Ohio, with 91 rejections in 35,704 men examined, or only 0.269 per cent. The variations in such figures reflect quite as much the relative capacity and conscientiousness of local boards as differences in the incidence of tuberculosis in the various geographical regions. It should be stated with regard to the National Army that the men had been examined not only by their local draft boards, but also by their regimental surgeons.

It was hoped that interesting results would be obtained as to the incidence of tuberculosis in the various parts of the United States by a comparison of the number of cases of the disease found in the respective camps. This hope has, however, been disappointed, partly on account of the varying excellence of the previous examinations and partly because the troops have been redistributed among the National Army camps to such an extent that the divisions, as finally constituted, do not represent fairly the territorial divisions from which the men of the draft at each of the camps were supposed to be drawn.

Complete reports have been received from seventeen divisions of the National Guard showing a total of 446,157 men examined, or 1.099 per cent, a percentage considerably higher than that of the National Army, 0.673 per cent, although most of the men were of longer service and no doubt had been frequently examined. In fairness, however, it should be stated that some of the National Guard divisions were filled up to their complement with drafted men, so that the case for the National Guard may not be as unfavorable as at first sight appears.

Viewing the examinations as a whole, we may say that it surely was worth while to have excluded 10,000 men from our army of whom the great majority without a shadow of a doubt had tuberculosis, even though a few were needlessly deprived of the privilege of serving and some that should have been found escaped detection. The large majority of these 10,000 men were found to have tuberculosis within a month or two after entrance into the service, in which case, if the disease were of a chronic type, it is evident that the disability must be classed as not in line of duty and as not, therefore, entitling the soldier to a pension. Now looking at the matter

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from the pecuniary side, a side in which you, as taxpayers, should be interested, it is a conservative estimate that the tuberculous soldier costs the Government on an average $1,000 for pensions. If even 5,000 men were therefore prevented from becoming pensioners on account of disabilities for which the Government could not be held responsible, a saving of $5,000,000 was effected. But if the examinations had not been made and the entire 10,000 had finally been returned from Europe, the cost to the Government, if we accept the Canadian estimate that each tuberculous soldier returned from Europe costs $5,000, would have been $50,000,000.

So much for the past; now as to the future. Under the present conditions, when every nerve is strained to collect available men and send them across the seas at the earliest possible moment, many desirable precautions are perforce neglected. Registrants are pouring into the camps in great numbers, and the time allowed for examinations in almost all cases has been so short that the examinations cannot be of the highest value. Again, in the pressure of training, time may not be allowed for the what now seems leisurely examinations of the past. The percentage of tuberculosis can hardly fail to rise under these conditions. The exigencies of the war excuses such a situation. It is to be deplored, but it is only one of the penalties which we must pay for our unpreparedness. Everything will be done which the conditions will allow, to continue to remove the tuberculous from the ranks of the army, but if it is found at a later time that there is nevertheless a regrettably large incidence of tuberculosis among our troops, please remember that the blame for this is not to be placed upon the Surgeon General, but upon the exigencies of the unparalleled situation in which we, as a people, now find ourselves.

A word as to the provision which the Government is making for the care of the tuberculous soldier. The William Wirt Winchester Memorial Tuberculosis Hospital at New Haven, Conn., built in the most substantial manner expressly for a tuberculosis hospital and entirely new, has been rented for the period of the war. The capacity of this institution will be increased by construction of temporary buildings to 550 beds. A hospital with a capacity of 750 patients has just been completed at Otisville, N. Y., on land belonging to the city of New York and adjacent to the municipal tuberculosis sanatorium. At Markleton, Penn., a sanatorium has been leased and will be increased in capacity to 325 beds. A hospital with the capacity of 1,000 beds is now under construction at Azalea,

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N. C., near Asheville. It will be ready for occupancy in the autumn. A hotel at Waynesville, N. C., has been leased. It has a capacity of 260 beds which will be temporarily increased by use of tentage to 600 beds. A 1,000-bed hospital is to be built at Denver, Colo. This will be constructed of hollow tile in a substantial manner. The post of Whipple Barracks, Ariz., near Prescott, has been turned over to the Surgeon General for use as a tuberculosis hospital. It is proposed to erect temporary buildings with a view to obtaining a capacity of from 750 to 1,000 beds.

Of these institutions the hospitals at Fort Bayard, New Haven, Markleton and Waynesville are now in operation with a total present capacity of 1,305 beds. The hospital at Otisville will be in operation before the end of the month, the other institutions will be ready before winter, giving a total of 5,875 beds available for the treatment of tuberculosis in the army. It should be added that the hospital at New Haven is used as a training school for the staffs of tuberculosis hospitals and for tuberculosis examiners.

The need of physicians who are experienced in internal medicine, and especially in tuberculosis work, is as urgent at present as it has been at any time since our country entered the war. Any physician qualified to be of assistance in this great work who can possibly be spared is urgently requested to offer his services at once.

Much interest has been aroused in the plans for reconstruction of the wounded or sick soldier. France and England have shown the way to us, and many are waiting with eagerness for the opportunity to enter upon the work of reconstruction for our own soldiers. Primarily, of course, the idea is to care for the maimed, to prevent loss of function in injured limbs by therapeutic exercises at first, exchanged as soon as may be for vocational therapy exercises which produce useful results, which teach greater skill, open up new paths, reawaken hope of usefulness, remove the notion so easily presented to the thought of the unfortunate cripple that he is forever to be helpless and useless. Such ideas are most natural; sometimes they are almost absurd in their intensity of hopelessness.

During the Civil War there was an association in Washington, the members of which agreed to seek out the men from their own state who were sick in the large hospitals in or near the city and devote their especial attention to them. A gentleman, who has but recently died, lost his arm from an accident in boyhood before the war. He was from Ohio and it was his duty, as a member of the association, to seek out the men from Ohio who had lost an arm and

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cheer them up. He once told me that he found one patient plunged in deepest despair who asked him, "Can I put on my pants with one hand? "Yes, indeed," he replied, "you can do that; you can dress without help; you can even tie your own necktie." Whereupon he proceeded to untie and tie again his cravat into a bow, a very creditable bow, too, I know, for I have seen him do it. After this experience he never failed to demonstrate his skill by making bows in his necktie for all the one-armed men that he met, consoling them greatly by so doing. Reconstruction as a formal procedure was not known in those days, yet this was an act of moral reconstruction, for it kept hope alive and presented new ideas of unthought-of dexterities, of wider usefulness to those who were ready to despair.

When the need of examiners for tuberculosis was greatest, it was found necessary to institute a course in physical diagnosis covering first the signs of the normal chest, later those signs which are characteristic of disease. This course involved the direct personal attention of the instructor to a quite limited number of pupils, who began from the very beginning and were conducted step by step in such a way that they were obliged to learn or confess their incapacity. The success of this course was a revelation to us. It showed that many physicians, those who had not had the benefit of intensive training, were ready and eager to learn if they were put upon the proper course, especially if they could themselves palpate, auscultate and percuss, if they could themselves feel, hear and see the phenomena which they were studying and could continue the work until they felt sure that they were proficient. It was a pleasure for them to take the necessary steps themselves and to feel that their progress was a real one, whereas if they had simply been shown how the instructor proceeded, had simply listened while the instructor gave them a brief opportunity and then went on to some other subject, not caring whether his pupils really heard the sound in question or not, the latter would have received very little benefit. If men of education who, it might be thought, should be able to work out such problems unaided, received so great a stimulation from a little well-bestowed instruction, how much more will the wounded soldier, a man perhaps uneducated and untaught—how much more, I say, will he exult at the prospect when he finds not only that the way is not barred, but that new fields are opening before him and unsuspected capacities are developing as the result of wise and patient teaching. We can well understand the enthusiasm with which the philanthropist greets the prospect of such rich reward for his efforts. It is truly a noble work.

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But in looking forward to the work of reconstruction we must not indulge in unreasoning optimism and assume that, because there is every reason to anticipate that great good will be done, there will be no difficulties to surmount and no evils to avoid.

The first problem will be to induce the patient to remain under treatment. The following statement of the wishes of the Surgeon General has appeared in the daily Official Bulletin.

> Hereafter no member of the military service disabled in line of duty, even though not expected to return to duty, will be discharged from service until he has attained complete recovery, or as complete recovery as it is to be expected that he will attain when the nature of his disability is considered.

This announcement was at once received with much approval by numerous anti-tuberculosis associations. In fact, I suspect that the very active and efficient executive secretary of the National Tuberculosis Association has had something to do with the singular unanimity and contemporaneousness of the expressions of approbation which has reached the Surgeon General's Office. It is quite evident that the action indicated is one which very many would like to see carried out. Where so many are interested, it might be well to devote a few moments to the consideration of what difficulties may lie in the way of the full realization of the above program.

The people of the United States appear to be divided into two classes; one is represented by the anti-tuberculosis organizations just referred to. This class demands that the tuberculous soldier shall not be discharged until cured. The other class consists of those to whom it is perfectly apparent that, if a man has tuberculosis, he should be sent home at once; that manifestly there is no use in retaining such a man in the military service, where he will undoubtedly soon die because kept in hospital. To this class belong many anxious mothers, who most naturally long to see their sons again and have the gloomiest forebodings as to their future if they are not at once released and sent home to be cared for in a proper way. It is not impossible that the opinions of the two classes may conflict over a given case, that a youth sent home to his mother in compliance with her urgent request may apply to a charitable organization for assistance and thus call forth an irate letter from the secretary of that organization to the Surgeon General.

The situation as to discharge is then as follows: The first thought of every soldier when he learns that he has tuberculosis is to go home. If interrogated he almost always says that he desires discharge. If the case is not a hopeless one, our aim, however, will

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be to delay at least his discharge, sending him at first to a tuberculosis hospital and instituting at once a course of education so that he will learn what is to be expected from treatment and the conditions which make the treatment most efficacious. Many, it is to be hoped, will be won over to recognize the fact that their best course is to pursue faithfully the prescribed course of treatment. Some, the obstinate or the wayward, will resist such persuasion and live in discontent, and therefore do badly, until their wish for discharge is gratified. Others, no doubt, will invoke the aid of the influential in securing their release. But while it will be necessary to discharge a certain percentage for such reasons, we can only hope that the success of our endeavors will be such that this percentage will represent but a small minority of our patients, that the large majority of them will enter hopefully upon the work of their own reconstruction.

Let us now, for a moment, consider what obstacle there may be in the work of reconstructing the maimed soldier when he decides to remain in our care. First is the very natural desire of the soldier to return on furlough to his family and home. While for such injuries as simple amputations a visit of this kind might do no great harm, in other more complicated cases, in which persistent effort is necessary to restore and maintain the function of wounded nerve and muscle, no such vacations should be permitted; the wounded man has put his hands to the plough and must not look back. The second obstacle may be presented by a too indulgent government which shall pay a man as much to remain idle as he could gain by continuing his work. There is no doubt that the pensions system has done much harm in the past by enabling its beneficiaries to live in idleness. Fortunately, by the War Risk Insurance Act, compensation is provided instead of pension, and that compensation may be given under rules which will make it worth the soldier's while to reman under tutelage, rather than to take his discharge and live at home without work.

Just what will be done in this matter is, so far as I know, not yet laid down in rules. Let us hope that the regulations will be wise and that they will not be relaxed under pressure, or under any idea of misguided philanthropy. This is a subject which well deserves the attention of the philanthropist. In my judgment it is of the utmost importance that the fact be clearly perceived by those in authority, that many men will prefer to live without work, if they can maintain themselves on a government allowance, rather than to continue a course of instruction even though such a course

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holds forth the promise of greater proficiency and higher pecuniary reward than the individual has ever attained in his days of health. I speak here from the knowledge gained by association for many years with discharged soldiers. It is true that some are naturally industrious, and it is to be hoped that many will become deeply interested in the new occupations suited to their peculiar aptitudes, but there are many who are neither naturally industrious nor endowed with any marked aptitude who may present a problem for the philanthropist. The number will, of course be the less the more wise and patient, and therefore the more successful, the instructor.

Such are some of the problems which may present themselves for solution in the case of the maimed soldier. How is it with the tuberculous soldier? In his case the problems present additional difficulties. In the case of the wounded man the effort is to lose no time. Reconstruction begins at the earliest possible date, at first simply by exercises which seek to maintain function, at a later time and as soon as possible, by exercises which involve useful and interesting work. The tuberculous man has lost none of his members, and in so far his case seems the more simple one. But, as Landouzy says, he is "wounded with tuberculosis," and this is a serious kind of wound which demands at first a different treatment, for here the effort is not to set the patient at work as soon as possible. If his disease is of gravity, the effort is on the contrary to keep him still, it may be for many months, in order to combat the restlessness of the exhausted and therefore irritable nervous system and to teach that complete relaxation of mind and body which will allow the weakened patient to conserve all his energies for the important work of reconstructing his nervous system and of developing the mysterious substances which shall arrest the activities of the tubercle bacillus. There will be small wonder if, this being successfully accomplished, many of the patients will like too well the life of ease and indolence and will shrink from entering the stage of active work when that at last lies before them.

The tuberculous patient, if still in a stage of the disease in which there remains hope of cure, is unfortunate, because it is not possible for him to be guided by his own sensations in determining how much exertion he may safely take. The tuberculous often do not realize that they are ill until they are very ill. For this reason no patient more needs the council of a judicious and able physician, and for this reason, too, interruptions in the treatment, and particularly visits to his home, are peculiarly harmful to him. We can readily see how much excitement, how many inducements to

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overexertion, such a visit must offer, which are the more dangerous because the very joy of being with his loved ones arouses a deceptive and therefore dangerous sense of well-being.

I am therefore not in accord with those who urge that the consumptive soldier should be treated in places near his home in order that his visits to his friends may be frequent, because easily made. My philanthropy is of a sterner mold and demands that the attention of the patient to the great business of getting well shall not suffer any diversion, however pleasant.

When war was declared, it was announced that leaves of absence would no longer be granted. This is no time for soldiers to absent themselves from duty for their own pleasure, even though the enemy they would combat is thousands of miles away across the seas. Similarly the consumptive who is engaged, whether he will or will not, in a conflict with an equally ruthless and untiring foe, must know no respite. We of the service of the rear may render him some aid, but he is at grips with the enemy, and upon him the result of the battle must depend. The treatment of tuberculosis, rightly apprehended, is a most difficult treatment, because it means the teaching of a mode of life which demands an irksome monotony when the mind craves diversion, and long rest when the body may not be conscious that rest is needful. A patient who masters the principles involved and carries them out successfully has had a training in self-restraint which will make him something of a philosopher. It is unnecessary to say that the physician who effects such a transformation must likewise have in him something of the devotion and persistence of the missionary. He must believe what he teaches and have the power of inspiring his patient with his own confidence. He has by far the most difficult task of all the specialists engaged in the work of reconstruction.

To accomplish the results hoped for in a service of many hospitals, a standardization of treatment is necessary. It will not do for the patient to receive contradictory instructions as he passes from one hospital to another. To effect this standardization a course of instruction has been instituted which, so far as there is opportunity, will be given to all the medical officers who are to be engaged in this great work. If they are imbued with the proper zeal and endowed with the necessary skill, much can be accomplished and an identical course of treatment given to some thousands of patients should furnish an important and, I hope, helpful contribution to the knowledge of the art in which we are all so much interested, the reconstruction of the tuberculous.

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TUBERCULOSIS AS AN ARMY PROBLEM

By Surgeon LAWRASON BROWN, U. S. Army, and Major JOSEPH H. PRATT, M. R. C.

THE importance of tuberculosis in the modern army has been clearly recognized and it has seemed to us that a brief review of the tuberculosis examinations at one cantonment with criticisms of methods and suggestions for future work may prove of interest.

The number of tuberculosis cases reported from the French army, although later largely reduced, and the occurrence of about one per cent of tuberculosis in the Italian army after a preliminary examination, have led many to believe that from 1 to 2 per cent of our soldiers will be returned home tuberculous. England, although her men have not suffered excessively from tuberculosis, forbids her recruiting boards from taking men "who have been under treatment in a sanatorium and men who have been notified as suffering from tuberculosis." Germany has found some patients who were treated in sanatoria to have had no tuberculosis and called them to the colors. The great expense of transporting men to France and of maintaining them there has clearly emphasized the necessity of excluding from the ranks all men likely to succumb to disease. All these facts seem to us to indicate the necessity of a most careful study of the methods of examination of all men in our army.

ORGANIZATION OF THE TUBERCULOSIS EXAMINING BOARD AT CAMP DEVENS

We gained our experience while serving on this board which examined 27,300 men of the first draft of the National Army. The board consists of nineteen physicians. All but two of these gave their full time to the work. The board included five specialists in pulmonary tuberculosis who served as temporary surgeons. Nine officers of the Reserve Corps who served on the board had received, at the Walter Reed Hospital in Washington, special instructions in the method of making and reporting examinations devised by Colonel Bushnell. Two other members of the board had had several months' experience in examining men in the National Guard and the officers' training camps. It will thus be seen that the Surgeon General's office provided a large and well-trained board for the difficult task of examining rapidly and thoroughly, for tuberculosis, the officers and men of the 76th Division.

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Every facility for good work was provided by the division surgeon, Lieut. Col. W. A. Powell, and, thanks to his constant support, the work proceeded rapidly and satisfactorily.

A special building was assigned to the board for quarters, and in this was a room under the charge of a clerk where the records of the board were kept, and a large assembly room which was used for special examinations and evening conferences.

The whole board was under the direction of a president, who was responsible directly to the division surgeon. The rapid routine examinations were carried out by five groups of three members each called "local boards." In charge of each board was a president. Six enlisted men of the hospital corps were assigned to each board to assist in these examinations. Two did the clerical work. One of these made the typewritten reports. Two men outside the examining room instructed the men to breathe and cough in the manner prescribed, distributed history blanks, and aided the men in filling them out properly. The remaining two kept the three examiners constantly supplied with men, who were ushered in quietly from the outer room.

The local boards met in infirmaries, unoccupied buildings or barracks belonging to the regiment which they were examining. In spite of the interruption of the regular work by our examination, every assistance was given by the commanding officers of regiments and companies and by the regimental surgeons to the local boards. Nominal lists, according to a standard form, and history sheets with mimeographed questions were prepared by each organization. Quiet was preserved in the buildings in which our examinations were held.

Each examiner was expected to examine at least fifty men a day, and we were urged to increase this number to one hundred a day if possible.

Histories.—We were not required to take clinical histories. As each board of three members was required to examine 150 to 250 men a day, it is evident that there was no time to take regular histories. Although exemption from military service must be based on objective signs, we held that it was important for our guidance to examine with special care the men who had symptoms suggestive of pulmonary tuberculosis or who claimed to have them. A simple method of obtaining this information was employed, without involving any labor on the part of the medical men.

Mimeographic copies of a questionnaire were made on sheets

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measuring 8½ by 11 inches, on low grade paper, by each organization in sufficient number to furnish one to each soldier of the command. This sheet became the record of the tuberculosis examination of each man. While waiting his turn outside the examining room each member of the quota entered the information desired upon his sheet. This gave at the top his name, organization, home address, and date of arrival at the camp. Then followed eight questions which, if truthfully answered, would bring to our knowledge the symptoms of pulmonary tuberculosis if they existed, or a past history or a family history of that disease. Two questions to aid in recognizing heart disease concluded the list, which was signed by the soldier. One of the enlisted men attached to each board aided the soldiers in answering the questions, and sometimes secured additional information regarding the history.

A tuberculosis ward of 32 beds was established at the base hospitol through the efforts of Colonel Powell for the observation of suspected cases of pulmonary tuberculosis and for the isolation of open cases until their discharge. This was in charge of a tuberculosis specialist stationed at the base hospital, to whom was referred all cases of evident or suspected phthisis discovered by our board. This important position was held for a time by Dr. Harry Lee Barnes, of Wallum Lake, R. I. In addition to the official tuberculosis specialist a member of our board, specially selected for his experience in the diagnosis of pulmonary tuberculosis, was stationed at the base hospital, where he examined all the cases referred by the local boards for further study. These two made the final diagnosis and decided whether a soldier with tuberculosis should be discharged or retained.

The Rapid Examination.—Each man was stripped to the waist. He was taught by one of the enlisted men while outside of the examining room to stand with shoulder muscles relaxed, to breathe somewhat more deeply and rapidly than normal, and to cough at the end of expiration.

If a man answered "Yes" to three or more of the eight questions bearing on pulmonary disease, his examination was delayed until the others of the group had been examined, and examination in these cases was usually made more carefully and leisurely. As soon as râles or abnormal breathing were detected in the rapid examination, the subject was asked to step out of the line and the examination not resumed until the remainder of the group had been examined by auscultation. A man found normal on auscul-

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tation had his record sheet marked O. K. He took this to the clerk, who checked his name on the nominal check list which was furnished by each company commander. The examination began at 8 a. m. After two or three hours of continuous work the quota of 75 to 150 men were examined, and the remainder of the forenoon was devoted to the study of the "hold-ups" or suspicious cases. The afternoon work, which began at 1 p. m., was similar to that of the morning.

Abnormal findings were briefly recorded by the first examiner who signed his name or initials. The case was then examined by a second member of the board, usually the president, who made a short note or, in case of agreement with the first examiner, simply signed his initials below those of other. These records were sent with the men to the tuberculosis specialist. The results of his examination, sputum report, X-ray findings and other data were copied on the back of the sheet, which was returned to the office of the board when the case was completed.

At the close of each day the president of each local board filed a statement of the number of cases examined that day, at the headquarters of the board. Once a week a summary of the work of the whole board was given to the division surgeon.

Results.—Among the entire command of 27,304 officers and men 184 cases of pulmonary tuberculosis were brought to light; 135 of these were rejected or discharged from the army, and 48 were retained in the service. The percentage of tuberculosis found was 0.67 of one per cent.

All of the men had been previously examined shortly after their arrival, and cases suspected to be tuberculous were referred to the tuberculosis specialist, Dr. H. L. Barnes. During the three months he was at Camp Devens he discovered 304 cases of tuberculosis. Up to February 1 about 65,000 had been mustered into the service. Adding our results to those of Dr. Barnes the total of 488 is obtained, and this is only 0.75 per cent of 65,000. This shows that the amount of tuberculosis in the newly assembled national army in this section of the country was not large. From this study one cannot draw any conclusions regarding the amount of tuberculosis in New England, because the number of men excluded for tuberculosis by the local exemption boards is not known.

More tuberculosis was found in the men from Boston, 2.5 per cent, than from any other section of the northeastern states represented in the 76th Division. The distribution of the disease ac-

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cording to the locality from which the men came, is given in the following table:

Locality	*Percentage*
Boston	2.5
Rhode Island, including Providence and Pawtucket	2.2
Northern New York, including Albany and Troy	1.7
Vermont and parts of Connecticut	1.7
Maine and New Hampshire	1.6
Northeastern Massachusetts, including Lynn and Salem	1.2
Connecticut	1.1
Southeastern Massachusetts, including New Bedford and Fall River	0.9

This means that more cases of tuberculosis were passed by the examiners in some cities and towns than in others, but it probably means also that the disease was more widespread in the district with the higher percentages. But of this we cannot be certain. It is hard to believe that it is so much less common in the mill towns of New Bedford and Fall River than in Boston, Providence and Albany.

The Reliability of the History.—As is well known, a reliable record of a patient's past history and present symptoms is of great value in determining the existence of pulmonary tuberculosis. Surgeons in the regular army learned in the course of long experience that little reliance could be placed on the statements concerning symptoms made by the average enlisted men in the old regular army. The men in the drafted army are different in type from the professional soldier. The national army is composed of all sorts and conditions of men. In its composition it is identical with the civilian population of the cities and towns from which it was drawn. It was to be expected, however, that the desire to escape from involuntary service would lead some men, possibly many, to make false statements in a clinical history. It was the impression of most of our examiners that a large majority of the men told the truth. The statements regarding subjective symptoms were found a distinct aid in detecting cases with objective signs. Among a series of 67 cases with evidence on physical examination, 52 had one or more subjective symptoms suggestive of phthisis.

To get facts bearing on the reliability of the statements of drafted men regarding past or present symptoms 500 records were analyzed. Those selected were of men from southeastern Massachusetts, and were taken as a representative group of New England

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soldiers. Most of the men came from Fall River and New Bedford. Many had French or Irish names. None of the 500 was found on examination to present any evidence of lung disease.

TABLE 1.—*Analysis of Histories of 500 Drafted Men from Southeastern Massachusetts*

37, or 7.4 per cent, gave a family history of consumption.
28, or 5.6 per cent, claimed to have had pleurisy.
23, or 4.6 per cent, claimed to have coughed up blood or blood-streaked sputum at some time.
59, or 11.8 per cent, claimed to have had a cough lasting a month or more.
41, or 8.2 per cent, claimed to have had night sweats.
37, or 7.4 per cent, asserted they had lost weight in the six months before coming to camp.
39, or 7.8 per cent, asserted they had lost weight since coming to camp.
13, or 2.6 per cent, claimed they had lost strength since coming to camp.

It is clear that this group of men, as a whole, were not making false statements, as 334 out of 500, or 67 per cent, answered "No" to all the questions.

It is interesting to compare these figures with those obtained from 100 men who lived chiefly in the smaller towns of Bristol County, excluding all men from the large mill towns of Fall River and New Bedford. This list contained many English names and few foreign ones. Instead of showing fewer affirmative answers there were more to each question. The percentage in the large group ranged from 2.6 to 11.8, as shown in Table 1, while in this smaller group from country districts the range was 7 to 24 per cent, and only 61 per cent gave negative answers to all questions.

Men who had voluntarily enlisted would not be likely to answer these questions falsely in the affirmative, especially as chronic tuberculosis, if diagnosed at the time of our examination, would be considered as a disease contracted prior to entry into service, at least in most instances, and hence not entitling them to a pension. They might, however, conceal symptoms from patriotic motives, or possibly with the hope of securing a pension later if the disease were overlooked at the time of our examination. For these reasons the percentage of affirmative answers in this group would be expected to be less than the true number.

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TABLE 2.—*Analysis of History Records of 500 Enlisted Men in a Regiment of Engineers*

30, or 8 per cent, answered "Yes" to question relating to the family history.

22, or 4.4 per cent, answered "Yes" to question relating to pleurisy.

22, or 4.4 per cent, answered "Yes" to question relating to blood-streaked sputum.

17, or 3.4 per cent, answered "Yes" to question relating to night sweats.

5, or 1 per cent, answered "Yes" to question relating to loss of weight.

404, or 81 per cent, answered "No" to all questions.

If these percentages be accepted as less than the truth, then it must follow that the percentages given in Table 1 are not excessive, as the difference between them and those in Table 2 is small; in one instance, that dealing with blood in the sputum, it amounts only to 0.2 per cent.

The volunteers were probably, on the whole, healthier and more vigorous than the drafted men and the physical requirements for admission more rigid. These differences in selection could readily explain the slightly higher percentage of men with negative histories among the volunteers.

Only one drafted man among the 500 presented a history that raised suspicions of malingering in the minds of the examiners.

The records of companies composed largely of foreigners were also examined. Many of these could speak but little English. The percentage of affirmative answers was much larger among men found on examination to have healthy lungs in this group than in the others studied.

TABLE 3.—*History Records of 500 Drafted Men Belonging to Companies Composed in Large Part of Foreign-born Who Knew but Little English.*

94, or 18.8 per cent, answered "Yes" to question relating to family history.

80, or 16 per cent, answered "Yes" to question relating to pleurisy.

114, or 22.8 per cent, answered "Yes" to question relating to blood in sputum.

119, or 23.8 per cent, answered "Yes"' to question relating to night sweats.

96, or 19.2 per cent, answered "Yes" to question relating to loss of weight.

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The high percentages given in Table 3 shows that little reliance could be placed on the recorded statements of these groups of ignorant foreigners. Many, without doubt, did not understand the questions, but the conclusion seems justifiable that not a few were lying with the hope that it would aid them in getting out of the military service.

Efficiency Tests of the Tuberculosis Board Examiners.—All were supposed to be skilled in the diagnosis of pulmonary tuberculosis. As already stated, the members of the board, taken as a whole, were excellent. The board was strengthened by the presence of several well-known specialists, who served as contract surgeons. It was difficult to judge the diagnostic acumen of the individual men during the course of the examinations. They were working under five different local presidents in five different parts of the camp. Each of the fifteen medical men on these boards was examining daily about the same number of soldiers. Their task was to pick out the cases of tuberculosis by the rapid method of auscultation. All cases of suspected or undoubted diseases were referred to one general disability board, who made the final examination. Dr. H. L. Barnes, Dr. L. Brown and Dr. E. R. Baldwin served on this board in succession.

As the percentage of tuberculosis was found to be only 0.67 per cent, it meant that, on the average, one would have to examine 149 men to find a single case of tuberculosis. If 80 chests were examined every day, the member of the board who found a case of tuberculosis every other day would be equalling the average record. Although the element of chance is a factor to be considered, the keenest diagnosticians would be expected to discover the most cases in the long run.

The following table shows the number of cases of tuberculosis detected by each of ten members of the board in the course of examining about 15,000 soldiers:

TABLE 4.—*Number of Cases of Tuberculosis Detected by 10 Examiners in the Preliminary Rapid Examination of About 15,000 Soldiers.*

	No. of cases found		No. of cases found
A.....	16	F.....	8
B.....	13	G.....	6
C.....	12	H.....	4
D.....	12	I.....	2
E.....	8	J.....	2

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The results obtained by this test agreed remarkably well with our estimates of the diagnostic skill of the different physicians. "A," "C," and "D" were known to be excellent men. "B's" good showing was a surprise, as he was not generally regarded as a man of special ability in tuberculosis and his experience had been slight. "A" and "D" had been specialists in tuberculosis work since they began practice. The poor showing made by "I" and "J" deserves special comment. The president of the local board on which "I" served reported that he feared cases were being overlooked by "I," as he rarely found even a questionable case. Before entering into the reserve corps he had had little, if any, experience in tuberculosis work. "J's" work was careless and hasty. He spent less time in examining a chest than any other member of the board. He admitted frankly that he did not auscultate above the clavicles. His record of only two cases is poorer than "I's," because he examined many more men before his incompetency was discovered.

The Tuberculosis Disability Board.—When the soldier suspected of having pulmonary tuberculosis reached the base hospital, he was sent at once to the registrar and referred to the tuberculosis ward. After a short rest his temperature, pulse and respiration were noted and he was again examined. This examination consisted of the usual methods of pulmonary exploration, rapid inspection for general configuration of the chest, relative height of the shoulders, localized retraction, movement of the chest, palpation, percussion (greatly interfered with by the almost constant noise), and auscultation. Owing to lack of time only abnormal conditions were noted. Before the examination a brief history was taken, entirely independent of the questionnaire he brought with him from the tuberculosis board. After noting the date, name, rank, age, address, date of arrival in camp, his company and regiment, a note was made of how he looked and felt; the occurrence of family tuberculosis, of pneumonia, pleurisy, blood spitting (amount), cough, expectoration, night sweats, loss of weight and strength, shortness of breath, recent colds, his height and usual weight (we had no scales), and, finally, whether or not he liked the army.

The members of the local tuberculosis boards at times requested sputum and X-ray examinations. These were done, and the results reported back to them, but usually the case was referred to the tuberculosis specialist for study. If the man had a suspicious history, or if the local board found abnormal physical signs which the members of the tuberculosis disability board could not confirm, or

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again if the disability board heard such changes, an X-ray examin ation was made. If the temperature or pulse were abnormal, the man was held for observation in the ward and his sputum examined. Complement fixation was done in a number of cases. The sputum was supposed to be collected in the presence of one of the attendants.

Inasmuch as one of us worked on the tuberculosis disability board for only one month our statements refer to that period during which fifteen to twenty thousand men were examined by the various local boards. When either member of the disability board detected definite signs of tuberculosis, the other member was called upon to confirm or disagree with the findings. In all definite cases there was no disagreement, but in some borderline cases, as was quite natural, disagreements occurred, but were readily adjusted. The great value of Colonel Bushnell's instructions was manifest daily in our work, and we would have been hopelessly engaged in argument had we not possessed them. The great disparity between the findings of the local tuberculosis boards, obtained one to three days previously to our examinations, led us to believe that many men with acute conditions were sent to us.

In the final decision for retention or rejection from the army, the history obtained from the soldier was given very little weight. His physical examination was the all-important factor. Owing to the difficulty of obtaining sputum under surveillance, except from the men in the ward, fewer sputum examinations were made than should have been done. Any man with a positive sputum could have been admitted to the ward and his sputum reëxamined. The complement fixation was not employed extensively, for it seemed impossible to obtain blood from many men in whom we should have liked it done. The radiographic study of the case was held second in importance to the physical examination. When definite physical signs were found and the radiograph was confirmatory, the man was rejected if the physical signs were those of a potentially active lesion (indeterminate râles), or if of some extent, *i. e.*, to the third rib and fourth vertebral spine. If the lesion were less extensive and without râles and the radiograph showed a parenchymatous lesion of considerable extent, the man was often rejected. That a flat plate may not reveal a slight lesion, which may lie under a rib or separate definitely a parenchymatous from a peribronchial lesion, is recognized.

Our work in camp proved once more the great necessity of a

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radiographic study of some 10,000 men in the evaluation of radiographic changes. It is hoped that the army authorities may yet grasp the importance of this study, which could be done with comparatively little expense.

To Maj. Ernest L. Davis, the roentgenologist of Camp Devens, we are deeply indebted, and we desire to congratulate the army which commands the services of such a high type of man and of such an earnest student.

Râles in Army Examination.—The great stress laid upon the presence of râles in the army examination has led us to make a study of these adventitious sounds as detected by the board. At the very outset it was seen that the various varieties of râles were hopelessly confused, and that not only by men with little but by men with extensive training in physical examination of the chest. To mention but one instance, many examiners found only "crepitant" râles, and these occurred in many of their cases, acute or chronic. So it became apparent that the division of râles as suggested by the army authorities had been completely ignored and each man called râles other than sonorous and sibilant, crepitant or subcrepitant, fine or moderately coarse, as it seemed best to him.

In this study, based on 157 men referred to the disability board, we have used the following division of adventitious sounds: (1) pleural friction; (2) rhonchi—sonorous and sibilant râles; (3) crepitant râles (see Circ. 20); (4) fine râles (indeterminate); (5) moderately coarse (indeterminate); (6) coarse; (7) cavernous.

The "indeterminate" râle, as described by the Army Medical School, includes fine, moderately coarse, coarse and rhonchi. We have employed the term to cover râles, usually moderately coarse but varying in size, heard on expiration and inspiration, resonant or non-resonant; and at times detected only after the auscultatory cough. Flint used this term "indeterminate" for another sort of râle, and its confusion with "indefinite" is unfortunate. The subcrepitant râle includes the fine and some of the moderately coarse râles, but others have employed this term for all râles between the crepitant and cavernous. We make no use of this term. The "indeterminate" râle is the râle which indicates a tuberculous infiltration and bears a similar relation to the crepitant râle that the cold abscess does to the acute abscess.

Bushnell, in his classical paper, refers to the crepitant râle as the râle of pneumonic consolidation and advises that all men with such râles should be rejected. No idea of pulmonary consolidation

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was entertained by many members of the board when they used this term. Among 86 men referred to the tuberculosis specialist from one board, 69 were stated to have had "crepitant" râles. Of these 86 only 24 were finally diagnosed as having pulmonary tuberculosis, and of this number 3 did not fall in the group with the so-called "crepitant" râles. Of the 18 men discharged for pulmonary tuberculosis, 16 had these râles. So it is seen that only 23 per cent of the men with these "crepitant" râles were discharged for pulmonary tuberculosis, and 65 per cent with the "crepitant" râles were non-tuberculous and apparently suffered from only an acute or sub-acute bronchitis. These facts prove, it seems to us, that these observers did not hear "crepitant" râles.

Of the 157 men studied in detail only 46 (29 per cent) had no râles, but 8 were rejected on account of their general and pulmonary condition. Râles were present in 111 in the varieties shown in the accompanying table:

Variety	Total No.	Ac.	Re.	Site of râles						Basal râles	
				Apical		Apex or base or middle		Basal		Side	
				Ac.	Re.	Ac.	Re.	Ac.	Re.	R.	L.
Rhonchi	12	4	8	0	1 (?)	2	5	2	2	.....	.....
Crepitant	4	1 (?)	3	1	2	0	0	0	1	.....	.....
Fine	28	21	7	10	4	3	1	8	2	4	5
"Indeterminate"	37	4 (3?)	33	3 (2?)	30	0	0	1 (?)	3	3	1
Mod. coarse	14	7	7	3	3	2	1	2	3	1	4
Coarse	8	5	3	0	0	0	1	5	2	1	5
Indefinite	8	5	3	3	2	3	0	0	1	3	0
	111	47	64	20	42	9	8	18	14	12	15

Cases Without Râles.—Of the men without râles, 46 in number (29 per cent of the whole), 38 (83 per cent) were accepted. Three of the 8 rejected men had a parenchymatous lesion corresponding to or greater than the physical signs. One was in very poor general condition, and another had spent most of his time in camp as a patient in the base hospital; a sixth had pleurisy; a seventh had been told he had had pulmonary tuberculosis and had dense radiographic basal shadows, while it is difficult to see why we rejected the eighth.

Crepitant Râles.—All four cases had a parenchymatous lesion. In one instance the lesion was at the apex and the crepitant râles at the base were interpreted as atalectatic. The one man of this group who was accepted had had no symptoms and a normal temperature

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and pulse and was in good general condition, but had crepitant râles at one apex with a peribronchial lesion and a parenchymatous lesion (fine mottling) over the whole of the opposite side.

"Indeterminate" Râles.—These râles indicate usually a state of low-grade inflammatory reaction and are typical of chronic pulmonary tuberculosis. They are in army work an indication for rejection. Four of the 37 cases with this râle were accepted. One man, an adjutant of his company, had a cavity at his apex, but obtained a "waiver" from the Surgeon General's office in Washington. He had been well for ten or twelve years and in active work during that time. A second had no radiograph taken, but had râles to the fifth rib. One of us voted for rejection. A third had had râles below the fourth rib and the third vertebral spine, with coarse mottling in the seventh and eighth interspace (posteriorly). The agreement of the physical signs and the X-ray findings led one of us to vote for his rejection. The fourth case had questionable "indeterminate" râles and only a peribronchial lesion. It should be noted that, in a flat plate, it is at times impossible to separate accurately the two types of radiographic shadows.

Of the 33 men rejected, tubercle bacilli were found in 4, and absent in 2; complement fixation was positive in 3 of 10 cases. All these men had a parenchymatous lesion but one, and here there was a question about the plate.

Moderately Coarse Râles.—These râles were not heard during the short phase of respiration following cough, but were scattered through or heard in some part of inspiration. They were different from the "indeterminate" râle. Among the 14 cases, 6 were apical, 5 basal, and 3 apical and basal.

In the diagnosis of pulmonary tuberculosis, stress has been laid in the fact that the râles must be persistent both in location and on several examinations, and again throughout one examination. Among the 6 apical cases, 2 were noted as inconstant and put down to acute bronchitis, but neither of the two men had either at that time, or shortly before, a cold or bronchitis. One had an old pulmonary tuberculosis in the opposite side from the râles and was accepted, and the other had râles above both clavicles and was accepted. This man one month later broke down, had hemoptysis, tubercle bacilli in his sputum, and a tuberculous pneumonia. On examination, beside the inconstant râles, he had slight tenderness to the second rib on one side (left), and possibly slight dullness to the third vertebral spine on the other (right). He had had no symptoms.

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Some hold, and we believe it so, that râles at an apex, posteriorly, are more important than when heard anteriorly, but it must always be remembered that a clearing bronchitis may show râles only at one apex, posteriorly. In this group are three such cases; in 2 only a peribronchial lesion was found and the diagnosis of acute bronchitis was made. One of these was rejected; why, we cannot say. The râles cleared up on cough in his case. In the third case, which, however, had a parenchymatous lesion, a temperature of 99.6 was present, and he was rejected. The last man had apical râles, anteriorly and posteriorly, clearing on cough, but they persisted, and he had a parenchymatous lesion. He was accepted, because he looked well and had no symptoms.

Râles at a base are usually not due to pulmonary tuberculosis. Here were five men, three of whom were rejected. One had a definite basal non-tuberculous (?) lesion; another had clubbed fingers, and the third, whom one of us voted to accept, a peribronchial lesion at the apex. The other two had acute bronchitis and were accepted.

Three cases had lesions at the base and higher. One with a negative X-ray was rejected against my vote. Another with râles at the base and from the second to the fourth rib was accepted, although he had a parenchymatous lesion to the third rib. The third had no X-ray and was diagnosed as having acute bronchitis.

Coarse Râles.—Seven out of eight of these men had their râles at the base; the other over the upper half of the posterior chest and at the base also. He had coarse mottling to the fourth rib, and was rejected. One of the seven cases with râles at the base had coarse mottling at the apex and a history of having changed his residence on account of asthma; for these reasons he was rejected. In one other case the râles extended up to the third rib and seventh vertebral spine, and he also was rejected, although he had only a slight peribronchial lesion. We should have made certain that these râles persisted, *i. e.*, we should have reëxamined him a few weeks later, but the "90 days" were nearly up and we took a chance.

In one of these men we noted, what we had observed previously, that, after coughing for a time, râles are heard in areas where they were not present previously. In one man, only after hard coughing could râles be detected in the third interspace, although always present in the fourth.

Rhonchi.—The army includes rhonchi under the generic term "indeterminate." It is of interest to study these râles, which most

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of us have attributed to asthmatic conditions and acute or chronic bronchitis. One man had asthma, another an interlobar empyema, two non-tuberculous basal disease, and all were rejected. Two men had rhonchi over the whole of one side; one with an acute cold was accepted, although he had fine mottling to the fourth rib. The other had persistent râles, no cold and slight mottling, and was rejected. Another soldier, who was found to have rhonchi over one front and was recovering from a cold, was accepted. Of two with basal râles, one had definite and fairly extensive physical signs at the right upper with mottling to the fourth rib, and was rejected. In all, one-third of these privates had an old pulmonary tuberculosis, but only one, or possibly two, were rejected on this account. Hence, rhonchi rarely occurs alone in pulmonary tuberculosis.

Fine Râles.—These râles occurred without other râles in 28 men; fourteen times at the apex, ten times at the base, and four times in the middle of the lung.

In six cases with fine apical râles, they were inconstant. One was in poor general condition, and was rejected, though duty was voted, as was done for another who had had an old but definite apical lesion. Among the other eight were two rejections, one with extensive fine râles over much of the left front, with a peribronchial lesion and a silent parenchymatous lesion in the third and fourth interspace on the right. The other was in poor general condition and had apical râles. We voted for duty for him. It is curious to note that, of the remaining six, four had a parenchymatous lesion. So out of fourteen men with fine apical râles, four were rejected.

Fine râles at the base suggest the marginal sounds produced by separation of the two pleura in the plural sinus. The râles are of no moment, it is now held, though one of us long felt that they should suggest a more careful pulmonary exploration. Such râles were heard in eight; one with asthma and emphysema was rejected, and another, with what one of us took to be an inactive old apical parenchymatous lesion, was also rejected against his opinion. Two more had a parenchymatous lesion, and two had pleurisy among the six accepted.

It must not be overlooked that we have considered only the râles and not the other abnormal physical sign which led us to rejection in some of these cases.

Four men had fine râles in the middle of the lung. All were accepted, and one later had hemoptysis in camp and was rejected. He had coarse mottling to the third rib.

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Indefinite râles occur in many men, and we found them five times at the apex, once at the base, and twice in the middle of the lung. Twice they occurred at the apex with mottling, and once below the nipple with mottling from the second to the fourth rib, and the three men were rejected. Slight mottling occurred in two others. So, of eight men with indefinite râles, three were rejected.

The most striking fact is the high incidence of rejections among men with the "indeterminate" râle. As a matter of fact, all but one whose râles were not typically "indeterminate" should have been rejected. The importance of recognizing this râle cannot be overemphasized, as it excludes men from the service. The moderately coarse, coarse and indefinite râles were less, but equally important as regards rejection. The large number of rejections among those with rhonchi was due to the fact that many of these had disqualifying, non-tuberculous, non-apical conditions. The old law that apical conditions are usually tuberculous, and basal not so, seems to hold in this study. When the râles were apical, two-thirds of the men were rejected; when in the middle of the lung or at the base, only one-half were rejected. In 27 men with râles only at the base, they occurred fifteen times on the left side (66 per cent) and twelve on the right. The importance of râles is shown by the fact that three times as many men with râles (58 per cent) were rejected as without râles (17 per cent).

Disposition of the Cases.—When a man came with apparently quiescent disease but definite râles, a confirmatory X-ray, normal temperature and pulse and a negative sputum, or none at all, he was allowed to return to his company until his surgeon's certificate of disability (S. C. D.) came through. Owing to the crowded condition of the ward, a few men may have been returned to duty temporarily who should have remained in the ward. All men with fever or weakness were kept in the ward until discharged from the army. When the man was discharged, as far as known, no attempt was made to help him in any way at first. In one case, a man with a temperature was compelled to walk and carry his bag to the station, 2 miles distant. This, of course, was an exceptional case, and due to some individual error. At times there seemed to be delay in getting the S. C. D. through, due to delay, usually at the base hospital. This, also, was no fault of the system. We feel that some social service work should be instituted to help the patients through this period, and an attempt was made to interest the chaplains, which met with some success.

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Symptoms in Men with Pulmonary Tuberculosis.—Among a series of 159 cases of pulmonary tuberculosis, the sputum was found to be positive in only 10. The temperature was rarely elevated or the pulse definitely accelerated. Analysis of the records of 67 cases showed that only 13 per cent claimed to have lost strength, and only 10 per cent thought they had lost weight since coming to the camp; 22 per cent had no symptoms. It is evident from this data that most of the cases were inactive or healed. A striking feature brought out by this study was the number of cases with signs of widespread involvement of the lungs, who had never had symptoms. It should be remembered that over 300 cases had been rejected on account of tuberculosis before we began our examinations, and most of the men had been two or three months in camp when we examined them. During the early weeks of training a large number of cases with active disease were admitted to the wards of the base hospital. For the most part these were instances of chronic tuberculosis that had not shown symptoms of activity until they began military training.

A widespread epidemic of influenza added to the difficulties of diagnosis at the time we made our examinations. This was chiefly characterized by a cough, which often lasted for a month or more. Many men stated that they had never had a cough previously of such long duration. In these cases fine or moderately coarse râles, localized at one or both apices, were common. They persisted frequently after the symptoms of influenza had disappeared.

Errors in Diagnosis Due to Absence of Definite Physical Signs.—Some diagnostic mistakes are, of course, unavoidable, but they deserve careful consideration in order to find means, if possible, for avoiding their repetition.

Case 1.—Lieut. A. Claimed to be feeling well. No history of loss of weight or strength. Râles present at one apex heard by two examiners. These were regarded as without significance, and he was passed as normal. A few weeks later, he developed acute tuberculous pneumonia.

Lesson.—Any patient with apical râles should be thoroughly examined and kept under observation. In this case, if he had been sent to the tuberculosis specialist at the base hospital, further study might have revealed signs of disease.

Case 2.—M. Negative history. Dullness at right apex; few râles at both apices. Radiograms showed normal right apex, linear markings increased at left apex. Examined by Baldwin, Brown and Pratt independently. Not regarded as a case of tuberculosis. Within two

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weeks an hemoptysis occurred and tubercle bacilli were found in the sputum. Too much importance placed on the negative X-ray. Sputum examination not made until after the hemoptysis, owing to difficulty of collecting satisfactory specimen, which must be obtained in presence of physicians or nurse in order to avoid deception.

Case 3.—B. Taken ill at his home with what was thought to be influenza. Gave a history of losing about 15 pounds in weight during attack. Passed; a physical examination was negative and temperature and pulse normal. Regimental surgeon struck with change in patient's appearance; recognized that he had lost much weight. He sent patient to the base hospital, where tubercle bacilli were found in the sputum. In this case, too much dependence was placed on negative physical examination. The patient's statements in regard to loss of weight should have been confirmed by use of scales and not disregarded. Unfortunately, at the time we did our work scales were not available.

Some soldiers with few physical signs and few symptoms at time of examination have active disease not checked by return to quiet life.

Case 4.—M. Answered "No" to every question on the history sheet. Later stated that he had had one drenching night sweat; no cough. He insisted that he had not lost in strength, but had fallen off a few pounds in weight. Slight dulness to second rib, right front. Vesicular breathing. Fine inconstant râles above both clavicles. He was returned to duty. A few weeks later slight hemoptysis; positive sputum. Discharged from army, January 14, 1918. He spent the following month at his home in New Brunswick. He did not gain. He spent his time driving and walking; driving two or three hours, walking less than a mile. Afternoon fever while there for the first time. Maximum temperature, he says, was 104°. He kept in bed until the temperature was nearly normal. He returned to Boston, February 20. Temperature still slightly elevated in the afternoon. Average 99° for two or three days following his return. Normal weight, 164 pounds. Lost 15 pounds at Camp Devens.

Physical Examination.—Weight, 149 pounds. Temperature 98.9°. Chest well developed. Slight dullness to third rib right front, over right supraspinous fossa and at the top of right axilla. Apical isthmus obliterated on right side. Bronchovesicular breathing over right apex posteriorly. Granular inspiration above second rib right front. After coughing, a few moderately coarse râles are heard over the right supraspinous fossa. Left lung, good resonance. Apical isthmus 3 cm. wide. Crepitant râles above left clavicle, two or three fine râles of equal size being heard with each inspiration. Possibly respiration is slightly diminished at left apex; vesicular in character.

Case 5.—O'B. Claimed to have a slight cough for two years and to have raised blood-streaked sputum frequently. He had lost about 4

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pounds during the ten weeks he had been in camp and 7 pounds during the six months before he came to camp. The only physical sign in the lungs was some moderately coarse râles above the left clavicle after considerable coughing. At a later examination the râles were not heard. There was dulness at the top of the left lung and diminished breath sounds. The X-ray, however, showed parenchymatous shadows to the second rib on the right side. The wisdom of rejecting him on the X-ray findings was shown by the subsequent history. During the three months following his discharge, in spite of following a fairly rigid rest treatment, he gained no weight and ran a slightly elevated temperature.

The beneficial effect of bed-rest of short duration was well shown in the case of C. G. He gave a history of pleurisy in 1914, cough lasting for over two months and present at the time of the examination. He claimed to have lost 15 pounds since coming to camp. No loss of strength. He had fine râles to the second rib right front and posteriorly to the third vertebral spine. Temperature range in the hospital ward was 97° to 99.2°; pulse 80 to 94. The X-ray plates showed evidence of infiltration to the fourth interspace on both sides. The sputum was positive. He was discharged from Camp Devens and returned to his home in Brookline, Mass. He had no money saved. Wife was working and he was living with her family. Two days after his return, the nurse of the Emmanuel Church Tuberculosis Class called and he began the bed-rest treatment. This was carried out indoors. He occupied a corner room, which had two windows. He was kept in bed for seven weeks, aside from making a weekly trip to the class meeting and getting up for some of his meals. Exercise in the form of short walks was then begun. Against advice, he left the class and went to work two weeks later. He had gained 24 pounds in the eight weeks, the physical signs had disappeared, the sputum was free from tubercle bacilli, and he felt perfectly well.

Criticism and Suggestions.—(1) It seemed to us that the men should be examined sooner after their arrival at camp, and we have since learned that all men will in the future be examined at the depot brigade shortly after their arrival and before entering upon active drilling. We can readily see why this could not have been done before, and once more would like to bear testimony to the efficiency of the authorities in charge of the tuberculosis examinations in the army.

2. We feel that 25 men should be sent to the examining boards every half-hour, supplied with clean handkerchiefs and, if questionnaires be used, with pencils.

3. The questionnaires are valuable in the tuberculosis examinations for several reasons—they suggest a more careful examination

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when questions have been answered affirmatively; they are a check upon the men examined; they saved time as the man, transferred from board to board, had always his record with him; and, finally, they kept together all records and examinations made of each man and could be returned to the original board.

4. We cannot praise too highly Bushnell's rapid auscultatory method in tuberculosis examination in the army, and would suggest—

(*a*) That on the rapid examination, all suspicious cases should be kept for reëxamination until the quota for the morning or afternoon be finished.

(*b*) That day in and day out, morning and afternoon, the most suitable number of examinations proved to be about 40 for each examiner (80 a day), and this could for a time be increased to 50.

(*c*) That fuller description of the examinations required should be furnished the examiners and should include instructions somewhat as follows:

(1) Use auscultation only in first rapid examination.

(2) Listen to the breathing in four or five places at least on each side, front and back, before using the auscultatory cough.

(3) Use the auscultatory cough whether the breathing is normal or abnormal. (Circ. No. 20 does not make this clear.)

(4) Any man with râles detected by two members of the board should be referred to the tuberculosis specialist for study.

(5) Attention should be called to the fact that, as Laennac has pointed out, too hard coughing obscures rather than helps the detection of râles.

5. We recommend that the entire board meet weekly with the roentenologist and tuberculosis specialist to consider the cases referred to the tuberculosis specialist and by him accepted or rejected. At such conferences difficulties can be discussed and the workers greatly stimulated.

6. We would suggest that the examiners be urged to check up their physical examinations with the X-ray, but that they should recall that a negative X-ray, especially a flat plate, does not exclude the presence of pulmonary tuberculosis. However, such instances are of rare occurrence.

7. We would urge that a ward be set aside in the base hospital in each camp for the study of men suspected of pulmonary tuberculosis, and that it be equipped with scales and with a measuring rod.

8. We would recommend that the tuberculosis wards in the base hospital be used for the instruction in the art of diagnosis of pul-

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monary tuberculosis of all ward surgeons and other men on the medical staff, as well as all regimental surgeons, who are not proficient in this work. Colonel Bushnell's efforts to teach this to the Medical Corps of the army cannot be too highly praised.

9. Careful records of the work of each member of the board should be kept and checked up from time to time, in order to eliminate from the board careless and inefficient men.

10. The members of the tuberculosis disability board should be men who have had experience in dealing with pulmonary tuberculosis, and, if at all possible, men who have seen pulmonary tuberculosis in the army.

11. The president of the tuberculosis board should see that his assistants use the same terminology, and we recommend that suggested by Colonel Bushnell. The differentiation of the types of râles is most important.

12. To obtain the best results, the tuberculosis board should work in harmony with the division, brigade and regimental officers, realizing the great strain under which they, too, labor.

13. Greater provision should be made for the future disposition of the tuberculous soldier, when he has been in camp over two months.

14. We would recall finally that, even with great care, certain cases will develop tuberculosis when least expected.

15. We feel that more sputum examinations should be made, even when the sputum is not collected under surveillance. If positive, the man should be admitted to the base hospital and several sputum specimens, collected under observation, examined.

16. We would suggest that on each man's discharge card or blank be noted the reasons for his discharge and, if due to pulmonary disease, the location of such disease and the fact whether or not tubercle bacilli have been found.

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A STATISTICAL REVIEW OF THE PULMONARY AND CARDIOVASCULAR DEFECTS FOUND IN THE 82ND DIVISION, U. S. NATIONAL ARMY, CAMP GORDON, WITH A REPORT ON AFTER-RESULTS IN 500 MEASLES CASES[1]

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THE interest accorded a report on similar work at the Second Plattsburg Training Camp for Reserve Officers[2] seemed to warrant the publication of the results of the examinations of the officers and men of the 82nd Division, U. S. N. A. This work was done at Camp Gordan, Atlanta, Ga., between November 20th and January 31st, and covers the results of the examination of 34,304 officers and men, and is therefore statistically of more import than was the case with the report on the Plattsburg Camp, which dealt with a total of 3,134 candidates for reserve officers.

There are several features of this work and report which should be borne in mind in drawing conclusions from the figures given below. In the first place, practically all the officers were members of the Reserve Corps and had therefore been thoroughly examined before, while the enlisted personnel had also been examined twice, once by their draft boards, and they had also received a general physical examination on arrival in camp. But these examinations were of a general nature, and special or particular attention was not given to the heart and lungs. However, a great many men unfit for military service had already been eliminated in this way, so that the men examined by the Tuberculosis and Cardiovascular Board represented (to some extent at least in relation to the heart and lungs) a selected group. That the board found so many disqualifying lesions should not be considered, therefore, in any sense a criticism of the efficiency of these previous examinations, but should rather be looked upon as an indication of the wisdom of the repeated reëxamination of raw recruits after a period of hard work, if the purpose of such examination is to be fulfilled, which is not only to protect the Government and the recruit himself, but to ultimately secure men physically fit for the arduous life and duties of active

[1] This paper is based on the report of the Tuberculosis and Cardiovascular Board, constituted as follows: Major A. P. Francine, M. R. C., President; Captains, M. R. C.: R. D. Burke, W. H. Swan, J. Woods Price, A. D. Atkinson, Horace Luten, M. R. Wilkinson, H. C. Mix, J. A. Britten; First Lieutenants, M. R. C.: H. C. Godfrey, Andrew Anders, E. C. Ehlers, W. W. Woods, A. H. Eggers, W. J. Davis, G. E. McBride, N. P. McKee, E. C. Seale, G. E. Harhen, F. A. Glass, E. Goldman; Contract Surgeons First Lieutenants George Backman, H. Johnson.

[2] *Journal A. M. A.*, December 22, 1917: Capt. A. P. Francine, M. R. C.; First Lieut. J. Woods Price, M. R. C., and First Lieut. Francis B. Trudeau, C. S.

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military service. In this connection the possibility must be taken into account of latent pulmonary lesions being reactivated, and cardiac lesions in functionally weak hearts developed, by the hard military drills, subsequent to the latest physical examination.

The work here reported was done systematically and thoroughly, and with uniformity of judgment in recommending for discharge. The question of discharge was not left to the discretion of the board, but men found with disqualifying lesions were referred either to the S. C. D. (Surgeon's Certificate of Disability) Board of the Base Hospital, when the disqualifying lesion was plainly evident, or to the wards of the hospital for observation and further study where there was a doubt. The fact that of 592 men referred to the S. C. D. Board only 26 were returned to duty as not having disqualifying lesions (and these were from the group referred "for observation" and not discharge) may be pointed out as a confirmation of the judgment and work of the Tuberculosis and Cardiovascular Board. This uniformity of judgment was secured by having all cases picked out by the members of the board (18 of whom made the routine daily examinations) returned next morning to a small clearing committee of the board, whose judgment was final. This clearing committee was composed of Captains Price of Saranac Lake, Swan of Colorado Springs, Burke of Quincy, Mass., and the president of the board.

It is not pertinent to the present purpose to discuss in detail the methods of the work nor the system followed, except to say that the board examined in round numbers 1,000 men a day, each member working separately and seeing, as a rule, 70 to 80 men a day. Out of this daily total of 1,000 men examined, about 60 to 80 men with defects or questionable physical signs were held up to report next day to the clearing committee for final elimination, and from this latter group usually 7 to 10 men showing organic disqualifying lesions in heart or lungs were referred for S. C. D. or to the hospital for further study.

The relatively small number of absentees from the examinations is noteworthy, for there are a number of valid reasons for men in a company being absent at the hour set for their examination, and if they are not seen with their company it entails considerable difficulty at times to catch up with them.[3] It is further an indication

[3] For instance, a company roster will include the names of the men who are in the act of being transferred, and often those already transferred or even discharged; the names of men who cannot be spared at the time of the examination, certain military police, motor truck or ambulance drivers, etc.; the names of men detailed on special duty or to places distant from the camp, *i. e.*, on detached service in other cantonments, on the field ranges, etc.; the names of men sick in hospitals, either at the base hospital or Fort McPherson. The effort was made to catch the absentees in these large hospitals by systematically examining every patient in the wards; but even this caught only the men who happened to be in the hospital at the particular time this survey was made, and of course they were continually coming and going.

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of the extent of the coöperation of the company commanders with the work of the board; and also of the fact that those individual members of the board assigned to the work of following up absentees, both at the conclusion of the work and *pari passu* with it, did their work well.

It should be noted that out of 592 men referred to the S. C. D. Board or base hospital for study, only 6 remained unacted on by these sources at the conclusion of the work of the Tuberculosis and Cardiovascular Board. This implies more than appears on the surface, when dealing with such large groups of men, widely separated in a great camp and referred to a busy military hospital of 1,000 beds. An unflagging effort was kept up and was indeed called for to see that cases referred by the Tuberculosis and Cardiovascular Board did actually report to the hospital, did actually get into the proper ward and before the S. C. D. Board; and the results of the action of this latter board were followed up and recorded in every case.

It should further be noted in regard to the total number of cases reported as "referred" and given S. C. D., that not all of these belong to the credit of the Tuberculosis and Cardiovascular Board, for this heading includes all cases of pulmonary and cardiovascular defects referred by the regimental surgeons and from the hospital wards as well; in other words, the figures represent the total disqualifications for these causes in the 82nd Division from November 15th, the approximate date when the personnel of the various units was fully organized and filled, to February 8, the date the report of the Tuberculosis and Cardiovascular Board was completed. It has not seemed necessary to indicate here the proportion of the discharges attributable to these three different sources, though it is only fair to state that the large majority, as would under the circumstances be expected, was referred by the Tuberculosis and Cardiovascular Board. These relative proportions have, however, been indicated in the more detailed official report to the Surgeon General of the Army. It was felt wiser to include *all* discharges for pulmonary and cardiovascular defects in the report, because from a statistical point of view an erroneous idea would be given of the percentage of these defects in the various organizations and in the division as a whole, if the figures were confined to the work of the board alone. It consequently follows that as the work of eliminating these defects continues to go on through the work of the regimental surgeons and base hospital staff, the percentages given will ultimately be too low. So that,

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	Official totals, officers and men 1-31-18	Totals from Co. rosters during work	Absentees	Totals examined, officers and men	T. B. discharged	Per cent T. B.	Asthma discharged	% asthma	Heart discharged	Per cent heart	Total disqualifying lesions discharged	Per cent disqualifying lesions	Résumé of action of S. C. D. Board and grand total referred
82nd Div. Hdqs. (Attached and Unattached, Army Field Clerks and Statistical Detachment, and Div. Hdqs. Troop)	184	184	8	176	1	.56	0	.....	2	1.13	3	1.70	
319th Machine-Gun Batt. (Divisional Batt.)	733	787	21	766	5	.65	0	.....	1	.13	6	.76	
163d Infantry Brigade Hdqs. Company	19	19	1	18	0	.....	0	.....	0	.....	0		
320th Machine Gun Battalion	570	574	12	562	8	1.42	0	.....	3	.53	11	1.95	
325th Infantry	3,667	3,670	29	3,641	29	.79	4	.....	20	.54	53	1.45	
326th Infantry	3,643	3,729	21	3,708	31	.83	5	.....	28	.75	64	1.72	
164th Infantry Brigade Hdqs. Company	23	23	5	18	0	.....	0	.....	0	.....	0		
321st Machine Gun Battalion	571	557	6	551	3	.54	1	.....	4	.72	8	1.45	
327th Infantry	3,759	3,808	12	3,796	32	.84	4	.....	23	.55	59	1.55	
328th Infantry	3,770	3,812	19	3,793	31	.81	5	.....	21	.53	57	1.50	Discharged
157th Field Artillery, Brigade Hdqs. Co.	58	55	8	47	0	.....	0	.....	0	.....	0	.....	317 for T. B.
319th Field Artillery (Heavy)	1,662	1,778	22	1,756	17	.90	2	.....	7	.39	26	1.48	40 for A.
320th Field Artillery	1,443	1,496	13	1,483	7	.47	5	.....	10	.67	22	1.48	203 for H.
321st Field Artillery	1,444	1,478	23	1,455	9	.61	1	.....	5	.34	15	1.03	
307th Engineers Regiment and Train	1,571	1,593	20	1,573	16	1.01	2	.....	12	.76	30	1.90	560 men
307th Sanitary Train (4 Field Hospitals and 4 Ambulance Companies)	697	799	19	780	7	.88	1	.....	3	.38	11	1.41	26 to duty 6 unacted on
307th Field Signal Batt. and Sig. Sup. Off.	481	477	25	452	4	.88	0	.....	1	.22	5	1.10	
307th Hdq. Train of Military Police	307	330	5	325	2	.61	0	.....	2	.61	4	1.23	592 referred
307th Supply Train	396	423	10	413	2	.48	0	.....	2	.48	4	.96	
307th Ammunition Train	860	906	10	896	13	1.45	1	.....	5	.55	19	2.12	
307th Mobile Ordnance Repair Shop	68	28	1	27	0	.....	0	.....	0	.....	0		
307th Trench Mortar Batt.	182	185	0	185	1	.54	0	.....	1	.54	1	1.08	
157th Depot Brig., *i. e.*, 13th Training Batt.	4,918	6,498	173	6,325	91	1.44	8	.....	47	.74	146	2.30	
Quartermasters (Camp and Construction)	453	393	10	383	4	1.04	0	.....	3	.78	7	1.82	
School of Bakers and Cooks and 330th Bakery Co.	272	259	2	257	1	.38	0	.....	1	.38	2	.77	
340th Motor Truck Company	80	54	1	53	0	.....	0	.....	0	.....	0		
Fire Department Companies	36	33	0	33	0	.....	0	.....	0	.....	0		
107th Ordnance Supply Depot	97	102	5	97	0	.....	0	.....	0	.....	0		
Cantonment Hospital	403	374	6	368	1	.27	0	.....	0	.....	1	.27	
316th Auxiliary Remount Depot	273	315	7	308	2	.64	1	.....	2	.64	5	1.62	
U. S. Army Medical Supply Depot	59	59	0	59	0	.....	0	.....	0	.....	0	.....	
	32,692	34,798	494	34,304	317	.92	40	.11	203	.59	560	1.63	Totals
R. O. T. C., 10 officers and 618 men, examined with their organizations previous to entering training camp, therefore not entered separately as an organization.	1,599	1,456	36	1,420	2	.14	0	.....	0	.....	2	.14	Officers
	31,093	33,342	458	32,884	319	.97	40	.12	203	.61	562	1.70	Men

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except for this factor of subsequent discharges, the figures given are complete and accurate and represent an accurate standard of work and results.

Before considering these results, it is of interest to compare the percentages with those obtained under similar working conditions in the group of 3,134 candidates for commissions in the Officers' Reserve Corps at the Second Plattsburg Training Camp, and with the percentages in a group of 584 regular troops also examined there.[4]

Total examined	No. disqualifying T. B. lesions	Per cent	No. disqualifying heart lesions	Per cent	Total disqualifying lesions	Per cent
Candidates O. R. C., 3,134.....	10	.31	8	.25	18	.54
Regulars, 584.....	6	1.02	2	.34	8	1.37

The group of regulars is perhaps too small to mean much statistically, and many of them had recently been recruited into the service, so that they did not differ materially in appearance or physical characteristics nor in percentage showing from the drafted men examined at Gordon.

The candidates for reserve officers, however, were in the vast majority of cases college graduates of a high type of mental and physical development, many of them former college athletes, and young business or professional men used to athletic and outdoor sports. While examined more intensively than the larger group of drafted men, their percentage of disqualifying lesions is strikingly low.

In analyzing the table of the 82nd Division, the difference between the official census for the division on January 31st (32,692 officers and men) and the total from the company rosters during the work of the board (34,798 officers and men) is explained by discharges and transfer of men from one organization to another and from one cantonment to another. This shifting and readjusting process was continually going on, so that the weekly official census of the camp varied considerably.

The notation at the right of the table, "unacted on," means that for one reason or another the lesions, or suspected lesions, for which

[4] Report in *Journal A. M. A.*, referred to above.

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the men were referred for observation or discharge, had not yet been adjudicated by the S. C. D. Board. This is a relatively small number compared to the total acted on, and might be accounted for on a number of grounds, without any one individual being directly responsible or to blame. For instance, the case may have required considerable study and was still under observation; or the case may never have gotten into the hospital. At times the tuberculosis wards were so crowded that it was physically impossible to admit on a certain day the cases sent in that day, and though they should have been and were sent in on another day and admitted, yet here and there a man might be overlooked or lost sight of. Or a man might be transferred to another organization while awaiting admission to the tuberculosis wards. Again, as many of the drafted men were very ignorant and spoke little or no English, a man might report to the receiving ward and having lost the slip they were all given explaining reason for admission, would have no idea of why he was sent in, complain of some general symptom and be assigned to a wrong ward, remain in the hospital a variable period and be discharged, and the base hospital tuberculosis specialist never know that he was there. It should also be remembered that the distances were great, some organizations were 2 or even 3 miles from the hospital, and unless sent to the hospital in an ambulance or accompanied by a sergeant, which was not always possible, a man might get lost and never reach the hospital at all. This, of course, was not usual. There was thus the continual necessity, spoken of previously, for following up these cases, and for the constant collaboration between the tuberculosis specialist and the president of the board, to see that the former actually got his hands on cases referred to him, for it was only through him that final action could be secured by the S. C. D. Board.

In this connection, a word should be said of the ready and constant coöperation of the base hospital tuberculosis specialist, Capt. Cabot Lull, M. R. C., and of his persistent effort to supplement and render effective the work of the Tuberculosis and Cardiovascular Board by acting promptly on the cases referred to him and so clearing his calendar, by hunting up cases lost in other wards and getting them transferred to his own, and by many nightly "confabs" with the president of the board concerning the cases, when so far as his own interest was concerned he had been much better off in bed. And here, too, it is right to speak of, not only the courtesy, but the active coöperation of all the line officers and regi-

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mental surgeons with whom, and there were many, the members of the board had to deal. It was unfailing.

It will be noted that the largest percentage of discharges for disqualifying cardiovascular and pulmonary defects, and a third of the absentees, is found in the 157th Depot Brigade. It is to the depot brigade that men are usually assigned for preliminary training as they arrive in camp; and it is from here that they are transferred to recruit the permanent organizations or regiments to full strength. These men are consequently being continually transferred in small groups, and while their names appear on the company rosters of the depot brigade, the men themselves are not present when their company is examined. This difficulty was more apparent than real, however, as they were usually caught up with when their new organization was examined; or if this had already taken place, when the final round up of absentees took place. It follows in the case of absentees who appeared on the roster of the depot brigade, and yet had been subsequently seen and passed in the routine examination of the organizations to which they had been transferred, that it was practically impossible to identify them as depot brigade absentees, and so of the list of 173 given as absent from the depot brigade, probably half or three-quarters were actually examined by the board after transfer to other organizations. The list of absentees of the depot brigade represents then, the number of names not examined at that time, but many of the men themselves were examined later with other organizations.

THE TYPE OF TUBERCULOSIS

In regard to the type of tuberculosis, it appeared to be with few exceptions a low grade, subacute, localized process free from clinical symptoms. No doubt in some cases this represented the reactivation of an old latent lesion, in others a chronic tuberculosis which was previously undiscovered. There was usually some impairment of percussion note, with increased fremitus and harsh breathing, but the diagnostic feature was the presence of râles, usually small, dry or subcrepitant râles, or indeterminate râles, brought out only after cough. Crepitant râles were seldom, if ever heard. The breathing was often broncho-vesicular; sometimes the alteration was very slight indeed, not noticeable on quiet breathing. The diagnosis was never made and recorded unless the râles extended below the clavicle and were persistent. This is an important guide in

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recommending for disqualification in soldiers. The point of view of the examiner should be the elimination of men unfit for military service, on account of tuberculosis, and not the diagnosis of tuberculosis *per se,* as is the case in civil practice.

The winter at Camp Gordon was particularly cold and severe, and as such weather was unexpected and to a certain extent unprepared for, no doubt the cold was more sharply felt and more penetrating than would have been the case much farther north under different living conditions. There was much severe bronchitis, and it is likely that a certain number of these cases owe their activity to this factor, as distinct from the ordinary wear and tear of camp life; for it may be said that there is nothing in camp life which would be likely to reactivate a healed, localized tuberculous lesion. The environment is much cleaner and healthier than the vast majority of the men have been used to, and it is a splendid experience for anyone.

The living conditions in all training camps are fairly rough but not hard, and the military routine strenuous but not unduly so; in fact the life is one which an ordinary man in good health and spirits not only can endure, but enjoy and thrive on. Laymen usually have an exaggerated idea of such hardships as necessarily exist, or as may from time to time, from one cause or another, arise temporarily in severer form. There could be no better regimen for the physical and mental tuning up of ordinarily healthy men than the systematic graduated course of military training given in our camps and cantonments. It makes not only for greater physical efficiency, but for a brighter, manlier viewpoint as well. This was particularly noticeable in the drafted men at Camp Gordon, and especially as regards their improved spirits and sturdier outlook as the work went on. This cannot be emphasized too strongly, and it is stated after an experience of eleven months' residence and work in three different camps, for three different types or classes of men—in the training camp for reserve officers at Plattsburg, the National Army cantonment at Camp Gordon for drafted men, and the National Guard Camp at Camp Wadsworth for the New York Division with an enlisted personnel of volunteers—in all of which the life and training are along similar lines and they are wholly good.

The reactivation then, of a certain number of the tuberculous lesions was probably due to severe colds associated with the unaccustomed work; and in a smaller group this appeared to be secondary to measles and pneumonia epidemics. But it might almost

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seem as if the great majority of the cases were simply low-grade chronic processes, undiscovered previously and giving rise to no symptoms, but likely to break down under the severe conditions of active campaigning overseas, and therefore calling for disqualification. In this connection, it should be stated that while this report represents the work of all the members of the board, the views and comments expressed are those of only one, as the board being widely separated at the time this is being written, it is impossible to consult them individually, in fact any one of them, for confirmation of or agreement to the views expressed.

The X-ray plates of these cases—and many were taken—showed a monotonous uniformity of type. The limited infiltration and the enlargement of a few glands were largely of the same character, and even the same extent, so much so that the roentgenologist at the base hospital stated that one plate could practically be substituted for another in case after case, the only variation being as to whether the right or the left side was involved.[5] The plates were stereoptic.

An attempt has been made (p. 169) to classify the different lesions on a working basis according to their extent and localization, for it must be borne in mind that relatively few of these cases were active, incipient or moderately advanced cases in the usual sense of those terms. Some of the men were underweight and of poor physique, but they had no fever or cough as a rule. They had not recently lost weight because of a developing infection, but had always been underweight and of poor physique because of an old chronic latent infection.

This classification of pulmonary lesions should be interpreted as follows: Chronic active pulmonary lesions to mean a low-grade subacute exacerbation of an old chronic lesion, or in all probability a low-grade subacute and undiscovered chronic process, but in either event free from fever and, as a rule, cough or other clinical symptoms. In other words, a well-localized chronic process which would only be discovered by careful routine examination and which was not immediately incapacitating, but which would be likely to become so under the severer conditions of active campaigning in the field. Where such lesions were extensive, as in class three, the men were usually poorly nourished and of poor physique. All such lesions were of long standing and represented an earlier infection in childhood.

[5]For an admirable and clear description of the type of the less extensive (as well as the extensive) lesions found by X-ray see paper by Col. Geo. E. Bushnell, THE MILITARY SURGEON, April, 1918.

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ANALYSIS OF 306 CASES OF PULMONARY TUBERCULOSIS

Classification of lesions	Right lung			Left lung			Both lungs			Totals	Per cent	Tuberculous complications noted
	Active	Chronic active	Non-active chronic fibroid	Active	Chronic active	Non-active chronic fibroid	Active	Chronic active	Non-active chronic fibroid			
Class I, Incipient.....	6	74	0	2	55	0	0	10	0	147	48.03	Pleurisy with effusion 4 (3 left, 1 rightsided)
Class II, Moderately advanced	3 (lower lobe)	14 (Entire lung 2) (lower lobe 5)	8	2 (Lower lobe)	10 (Entire lung 2 lower lobe 12)	4	7	56	0	104	33.98	Discharging ears..... 8 Cervical adenitis.... 2 Fistula in ano..... 1
Class III, Far advanced.....	1	7	0	5	14	0	5	10	13	55	17.97	Laryngitis..... 1
Totals.....	10	95	8	9	79	4	12	76	13	306		

NOTE.—The lower lobe lesions were as a rule post pneumonic, the active lesions being unresolved pneumonia.

Active lesions..... 31 or 10.13 per cent.
Chronic active lesions. 250 or 81.69 per cent.
Chronic fibroid lesions 25 or 8.16 per cent.

Right lung evolved in 113 cases or 36.92 per cent
Left lung evolved in... 92 cases or 30.06 per cent
Both lungs evolved in..101 cases or 33.00 per cent

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Class 1, incipient, was limited to cover lesions not reaching below the third rib anteriorly or fifth vesicular spine posteriorly at one apex, as indicated by the presence of râles, slight impairment, etc. Where lesions at both apices were so classified, it meant that the combined extent of the envolvement was not greater than this.

Class 2, moderately advanced, covered lesions involving the right upper and middle lobe, or the left upper lobe, or both apices to a greater extent than under Class 1.

Class 3, far advanced, included lesions of an entire lower lobe or where an entire lung showed signs of infiltration, or where both upper lobes were involved, or where there appeared widespread disseminated lesions in both lungs, or about the roots of both lungs.

Those classified as chronic fibroid showed no evidence of activity whatever, and if limited in extent were not noted, but where these non-active lesions appeared sufficiently extensive to be incapacitating or likely to become so, such cases were referred for discharge. Such cases were classified as moderately or far advanced according to the extent of apparent envolvement and were usually associated with poor physique. Under directions from the Surgeon General's office small fibroid lesions were not recorded.

HEART LESIONS

In regard to the classification of heart lesions, cases noted under the usual terminology for organic heart lesions showed in every case the cardinal features of such lesions, and were discharged under the respective heading through the S. C. D. Board.

ANALYSIS OF 203 CARDIOVASCULAR LESIONS

Mitral regurgitation	72 or 35.46 per cent.	Double aortic	4 or 1.97 per cent
Chronic myocarditis (myocardial insufficiency)	69 or 33.99 per cent.	Double mitral	2 or .98 per cent
Mitral stenosis	25 or 12.31 per cent.	Aortic stenosis	2 or .98 per cent
Aortic regurgitation	16 or 7.88 per cent.	Acute dilatation	2 or 98 per cent
Exopthalmic goitre (hyperthyroidism)	11 or 5.41 per cent.		

The incidence of mitral stenosis in the foregoing table seems high, and in this group were included a number of cases showing the following physical signs: When standing, quiet, the heart appeared normal in size and the sounds clear, but after marking double time, hard, for a minute, there was heard over the mitral area a very loud, rough presystolic murmur, followed by an abrupt snapping first sound and accompanied by a thrill. The right heart could be percussed temporarily well beyond the right margin of the sternum, and in thin-chested subjects the dilatation could be both seen and felt. Some showed less clear-cut signs than the above, and not all of these cases were discharged. Those who had stood the work well, showed no breathlessness after the exercise test, were without

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history of rheumatism, and of good physique, were accepted; where the reverse was the case, the man was discharged under the above heading.

In regard to the heading "hyperthyroidism," few if any of the cases showed the complete syndrome of exophthalmic goitre. Exophthalmos was not a frequent sign, but enlargement of the thyroid with persistent tachycardia and nervous symptoms was.

Another heading which requires comment is the large group discharged on account of chronic myocarditis (Manual for the Medical Department, U. S. Army). This covered the group of men who showed a cardiac or myocardial insufficiency,[6] probably functional in character, as indicated clinically by falling out on hikes, general inability to keep up with the work and drills, and by palpitation, shortness of breath on exertion, and cardiac or general distress. The physical findings in these cases showed as a rule the heart moderately enlarged, with tachycardia on exertion, usually more or less persistent, the pulse rate often averaging 140 to 160 per minute and in some cases being arrhythmic. The heart sounds lacked muscle tone, and there were often present on exercise accidental or functional murmurs, systolic in time in the mitral and pulmonary areas, and sometimes heard over the entire precordium.

This condition of cardiac irritability and fatigue was often found in men not well developed muscularly, and in fat men whose occupation had been confining, like tailors, clerks, cigarmakers and the like, and they were of course in their existing condition unfit for regimental or line work. But the suggestion may be hazarded that if such men could be rested up and their muscular and circulatory efficiency developed by graduated exercises and drills, under closer observation and in a more systematic manner than is of course possible in routine military training in an army camp, they might after a certain period be able to resume their places in the ranks or at least be available for lighter branches of the service.[7] Whether this is worth while (except in the interest of the men themselves), in view of the relatively small number involved, 0.21 per cent of 34,304 men, and in view of the great number of men who will stand the training well and who are available, is an open question. But it might seem, too, as if a certain number of those disqualified as having an organic mitral regurgitation might in fact have had a

[6] For important contribution to the study of cardiac asthenia see paper, introduction by Thomas Lewis, THE MILITARY SURGEON, April, 1918.

[7] This was written before the results of the work of Lewis and his aassociates at the Heart hospital at Hampstead, England, were known to the writer, and is fully covered in their paper.

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more advanced stage of the same functional condition, where the dilatation had become sufficiently permanent and marked to simulate a true chronic endocarditis.

TUBERCULOSIS AND MEASLES

An order came through directing that all measles cases be examined for pulmonary tuberculosis one month after return to duty from the base hospital. There had been a severe epidemic of measles, and it was possible for the Tuberculosis and Cardiovascular Board to follow up and examine 513 cases, though this was only about a third of the total number which had been returned to duty more recently or were still in the hospital; and a special detail of medical officers from the board was left in camp to continue this work. The following were the results: Lungs normal, 461 cases; lungs showing acute bronchitis, 18; lungs showing clinical evidence of old tuberculous lesions not reactivated by measles, 18; lungs showing clinical evidence of chronic active pulmonary tuberculosis, 16. So that out of 513 cases from the base hospital after recovery from measles, 16, or 3.11 per cent, showed signs of active tuberculosis; and all of these were discharged from the service by the S. C. D. Board.

Comparing this percentage with the percentage of tuberculosis found, 0.92 per cent for the whole division, it would at first appear as if measles had been an important factor in reactivating old lesions. This view, however, is subject to some modification on further scrutiny for the following reasons: as there was still unfinished work for the board, a special detail of the board was assigned to examine these measles cases, and there can be no doubt that the examination by this smaller group of officers, of a special group of men, was more searching than the general routine examinations by the board as a whole. It could not be otherwise. All hold-ups were referred to the clearing committee for final diagnosis, in order to secure uniformity of judgment and experienced judgment. In this measles group these officers were not limited to the diagnosis of disqualifying lesions, as had been the case in the general examination, but spotted any lesion, however limited, which might in their judgment be considered active. Thus in this group of 16 cases the diagnosis was more refined or detailed than was the case with the camp as a whole. It is also possible that in one or two cases active tuberculosis may have been present before the men were taken ill with measles. It would seem, therefore, that 3.11 per cent, while representing accurately the number of cases of active tuberculosis in this special group, is too high if interpreted as an index of

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measles as a factor in the lighting up of old tuberculous foci. That it is a factor there can, of course, be no doubt. This is further confirmed by the extent of the lesions as recorded, which appear more advanced than in the records for the large group. The following is a grouping of the lesions in the 16 cases: Both upper lobes, 5 cases; both apices, 6; right upper, 2; left upper, 3.

TUBERCULOSIS AND RUBELLA

It may be of interest in connection with these figures for measles in the 82nd Division of drafted men at Camp Gordon, to refer to 183 cases definitely rubella in men of the 27th Division, National Guard, at Camp Wadsworth, examined for tuberculosis one month after returning from the base hospital, by the tuberculosis specialist to the hospital in consultation with the writer. In this group there were found one case of active tuberculosis, which was discharged the service; and two cases of chronic fibroid tuberculosis in men of robust type and free from symptoms who after study by X-ray were allowed to continue in active service with their respective organizations. This gives a percentage of 0.54 per cent of active tuberculosis following rubella, as against 3.11 per cent following true measles, a rather striking commentary on the latter group.

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THE MILITARY MANAGEMENT OF VENEREAL DISEASES—A SYMPOSIUM

THE MILITARY SURGEON, whose sole reason for existence is to promote the efficiency of the military services through their medical departments, is constrained to give much space to social evil diseases because of their serious inroads upon the fighting effective.

The impression seems to obtain in the minds of some, who should be better informed, that the military forces are the sources of such infections rather than their victims; whereas, it is quite apparent the prevalence of venereal diseases among civilians is far greater than among soldiers. We do not claim for soldiers a higher average ethical standard, though that we might safely do, but we do insist that statistics prove beyond peradventure that the method of handling the matter in the services reduces the incidence of these diseases far below that of civil life and, in this respect, the soldier has much more to fear from the civilian than the latter has from the soldier.

The methods set forth in these contributions to the symposium, and they might be added to *ad infinitem,* would seem to indicate that a uniform best method of meeting these endemic conditions within the camps has not yet been reached, that the line officers have not yet fully appreciated their responsibilities as between the country and the individual soldier, and that the venereal problem from its administrative standpoint has not yet been solved. A number of years' experience of prophylaxis, or punishment, in the regular establishments, has determined what seems to be an irreducible minimum of venereal incidence of 4 per thousand constantly noneffective. If this is to be maintained the military commanders, and not alone the medical department, should be held responsible for any marked increase over the established minimum.—EDITOR.

THE VENEREAL DISEASE PROBLEM AT CAMP BOWIE, FORT WORTH, TEXAS

BY COL. R. F. METCALFE, M. C., U. S. A.,
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Soon after the mobilization of the troops at Camp Bowie, a general survey of the men was ordered to determine the total number of infections. Each diseased man was registered and asked the following questions:

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When were you infected? Town or place where infected? Name of woman? Was she a friend or prostitute? Did you take prophylactic? We found on our first survey 553 cases, 395 having existed prior to coming to Fort Worth, and the other 158 claimed to have been infected at Fort Worth. This included the time from August 25th to November 30, 1917.

The regular semi-monthly inspections were made and a monthly report sent to the Division Surgeon which shows the following infections by months: Cases prior to enlistment and contracted outside Fort Worth, numbered 395, and cases contracted in Fort Worth numbered 158 between August 25 to November 30, 1917, during which period 2,015 prophylactics were taken.

	Cases contracted outside of Fort Worth			Cases contracted in Fort Worth			Prophylactics taken
	Syphilis	Gonorrhea	Chancroids	Syphilis	Gonorrhea	Chancroids	
December 1 to 31...	3	48	18	12	79	2	1,387
January 1 to 31...	9	64	28	19	101	21	1,640
February 1 to 28...	14	71	11	9	35	2	1,719
March 1 to 31...	13	51	14	27	27	9	1,602
April 1 to 30...	21	121	21	47	121	11	1,888

Conditions were watched carefully in and around Fort Worth. The once notorious restricted district, known as "Hell's Half Acre," had been closed several months before the location of the camp had been decided upon, but with the incoming soldiers came the women, both professional and clandestine types; there being no district they went to the cheaper hotels, and rooming houses. Bootleggers and automobile drivers acted as go-betweens and it became a constant chase of military police and civil authorities to locate these women.

In January the commissioner of police prepared the old workhouse as a detention hospital, and every prostitute arrested was examined and, if infected, was locked up and treated by the city physician. The name of every woman reported as having infected a soldier was turned over to the police and the woman locked up or sent out of the city, and in many instances returned on the next train. State and city laws make it possible to detain a woman as long as she has an infectious disease. The dance halls and various places of amusement were carefully watched, and some of them with unsavory reputations closed.

The question of better quarters than the workhouse was agitated, and the city, backed by the Chamber of Commerce, financed a detention hospital which was established in a sixty-five room hotel,

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which will accommodate two hundred women, modern plumbing, kitchen equipment and operating or treatment room installed and the county officials agreed to stand half of the expense. A medical officer from the camp has been detailed, in addition to his other duties, to look after the treatment of the women.

Having secured the necessary coöperation of the city and county officials for the detention and treatment of the women, I had the following instructions published to the surgeons of the camp, with a view of carrying out a systematic treatment and control of the infected soldiers:

One medical officer to be selected by the division surgeon, will be detailed, in addition to his other duties, as supervisor of venereal diseases throughout the division. Names will not be published in this order on account of the likelihood of frequent changes.

One medical officer will be detailed from each organization as officer in charge of genito-urinary work. Where possible, an officer with special training or inclinations will be selected. He will have direct charge, under the regimental surgeons, of all venereal diseases. He will prepare and keep posted up to date a book in which is entered the names of all men having venereal disease, by companies, giving rank, diagnosis, date reported, date of infection, place contracted, name and address of woman (when only first name obtainable that should be reported), prostitute or friend, was prophylaxis taken, if not taken date company commander was notified, and what action taken by company commander. This data will be secured from every man and a report made at the end of each month to the division surgeon, reporting all those cases not previously reported. This book will be labeled, "Venereal Diseases" (of specific organization).

This officer will keep under his personal charge all syphilitic registers. These will be kept posted and initialed to date, a new one being started for each new syphilitic case discovered. A duplicate will be furnished the commanding officer, base hospital.

All subacute or chronic syphilitics will be required to report to the syphilographer at the base hospital one day each week for anti-syphilitic treatment. Syphilitics of the 61st Field Artillery Brigade will report at base hospital at 1 p. m. each Monday; of the 71st Infantry Brigade, at 1 p. m. each Tuesday; of the 72nd Infantry Brigade, at 1 p. m. each Wednesday, and all others at 1 p. m. each Thursday. All syphilitics will be sent to the base hospital with a duplicate check list and in charge of a noncommissioned officer of the Medical Department. The officer in charge of service will note, on duplicate, treatment given and return at once to the organization surgeon.

All men discovered to have abrasions or sores on the genitals or suspicious sores on the lips or tongue will be sent at once, during day-

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light hours, to the syphilographer, base hospital, without any treatment whatever, for a dark-field examination. As any kind of antiseptic treatment destroys the value of this examination, none will be used until after the dark-field examination.

All cases of acute gonorrhea, cases of syphilis with open infectious lesions, or cases of chancroid, will be admitted to the base hospital for treatment. The chief of the genito-urinary service will determine when these cases may be safely dismissed from the hospital.

The regimental medical officer in charge of venereal disease will also have charge of the prophylactic station. He will see that there is always a sufficient supply of prophylactic remedies, that the syringes are not broken or nicked, that the equipment and medicines are kept in a cleanly condition, and that a space is arranged where the individual can take his prophylactic treatment without onlookers other than the hospital corps man in direct charge. A careful prophylactic record will be kept on the prescribed blank. These will be inspected once daily by the officer in charge, and then carefully filed for future reference. Army regulations permit of their destruction after ninety days.

The venereal inspections, which are made twice each month, should show a uniform plan throughout the division. An organization to be inspected should, preferably without previous notification of the men, be marched to the infirmary by a company officer, together with a complete roster in duplicate, one roster given to the surgeon, and the first sergeant of the organization will call off the names of the men as they are inspected and check all absentees, who will be reported to the genito-urinary examiner on the following day. Men sick in hospital will be so reported. Men in quarters must be inspected. Organizations of over 1,000 men should have additional examiners. Any doubtful cases will be submitted to the genito-urinary officer for examination.

All men, as they enter the infirmary for inspection, are to lower their trousers, exposing the upper half of their thighs and raising shirts, exposing genitals, abdomen and lower chest. Mouths, lips and throats will be inspected for mucous patches. This method must be carried out in all organizations. The examinations will take place twice each month, as prescribed in Army regulations.

A prophylactic station will be established and maintained at the venereal clinic in the Medical College Building, on Fifth Street below Calhoun. Will be in charge of a hospital corps man, and will be open from 7 to 12 p. m. each night.

The genito-urinary officer at the base hospital will furnish a record of the treatment given each syphilitic, and the regimental officer will see that this is properly inserted on the syphilitic register.

To enable regimental surgeons to keep in close touch with the progress and treatment of work on venereal diseases, each week, at 2 p. m., Tuesday, the genito-urinary specialist of the base hospital and the

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division officer in charge of venereal diseases will meet all surgeons doing this work at the base hospital for conference.

All venereal cases sent to the base hospital for treatment should state whether or not they have been previously reported to the division surgeon.

The following order was then published to the division requiring the coöperation of organization commanders, and the furnishing of duplicate company rosters:

1. All commanding officers and company commanders will coöperate with the surgeon in their care of venereal diseases by requiring all men of their organizations to report at the prescribed time to the organization surgeon for venereal inspection and the necessary venereal treatment.

2. Organizations should, preferably, be marched by a commissioned officer from the drill ground to the infirmary for inspections without giving the men an opportunity to remove evidence of disease. The company commander will prepare a duplicate roster of all men in his organization, and furnish same to the surgeon. A company officer will remain at the infirmary until inspection of company is completed. Men unable to attend venereal inspection the day of inspection will be required to report, in charge of a noncommissioned officer, on the following day at the appointed time.

3. The surgeon will report men to the company commander who have contracted venereal diseases and who have failed to take the prophylactic. These men will be brought to trial without delay, the result of the trial being reported by the company commander to the regimental surgeon.

4. Every enlisted man in this command, whether absent from the command or not, will, after sexual intercourse, immediately report to a venereal prophylactic station and take the prescribed prophylactic treatment. Failure to carry out this instruction will be cause for trial under the 96th Article of War.

5. Attention is invited to Paragraph 92, Compilation of General Orders, Circulars, etc., W. D., 1915.

Paragraph 4 will be read to organizations at three formations.

The necessity for this complete roster was due to the practice of infected men going to town for treatment and not reporting for venereal inspection. This was made possible by the laxness of company commanders in not requiring all men in command to report for inspection and the surgeon did not know who were expected to come, he only being aware that a number of men belonging to Company "A," "B," or "C," marched past and absentees were never considered or looked up, until a local physician informed the division

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surgeon that he was treating between thirty and forty soldiers for venereal diseases.

The Tuesday conference at the base hospital between the chief of genito-urinary service, the division officer in charge of venereal diseases, and the officer from each organization in charge of genito-urinary service, is proving of great value, and now four division genito-urinary medical officers are detailed to report at the base hospital from 1.00 p. m. to 5.00 p. m. daily for a week to assist the chief of service in the treatment of cases and to receive instructions in the proper management of cases. Each week a new unit of four medical officers report for this work and instruction.

Lectures and illustrated talks are given, illustrated placards are posted in the Y. M. C. A's, prophylactic stations are maintained in every organization, and a prophylactic station in the city.

We insist upon the recording of every case and no attempt is made to "camouflage" the report of the number of cases in the division. While it appears large, we know that it is as accurate as is possible to make it, and I am satisfied that the actual venereal situation at Fort Worth and Camp Bowie is as satisfactory as at any of the camps.

THE RADICAL TREATMENT OF LOCAL VENEREAL DISEASES BY CAUTERIZATION AND CIRCUMCISION

By Major GUY L. QUALLS
Medical Corps, U. S. Army

In presenting this discussion of a series of cases, and observations upon others, mentioned in this paper, I wish it understood that the method to be described is not in any way original with me. So far as I have been able to ascertain, the method originated with Dr. A. B. Herrick, former chief of the surgical clinic, Ancon Hospital, and has been used by him and his assistants there for the past ten years. We have been unable to determine why the method has not been reported and discussed before. It is probable, however, that it has not been considered of enough importance, as are many other local, apparently minor, operations and procedures in surgical practice.

The procedure in brief is as follows: Given a case of chancroidal or gonorrheal infection with phimosis or paraphimosis, the field of operation is cleansed thoroughly with tincture of iodine on gauze. All visible ulcerations are then cauterized wide of the ulcerated area by actual cautery, at the same time making sure that the cautery destroys all infected and diseased tissue in the base of the

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ulcers. A dorsal slit is then performed, the prepuce and glans are cleansed with tincture of iodine on gauze and all ulcerated areas on glans and prepuce are treated by cauterization, and in most cases the dorsal slit incision is lightly cauterized also. Circumcision is immediately done, care being taken if practicable not to cut through a cauterized area, thus leaving a part of the line of incision to heal by granulation. Should the case be one of gonorrheal phimosis the field of operation is cleansed with tincture of iodine, a dorsal slit it made, the wound lightly cauterized and, after delivery of the glans penis, circumcision is performed. In many cases of gonorrheal phimosis, after dorsal slit, an ulcerative balano posthitis or chancrodial infection is found. In such cases the treatment is actual cautery and circumcision.

Some of the cases of penile chancroids were complicated by a secondary extreme chancroidal infection of the groin or other parts about the genitalia. In these iodine is applied and thorough cauterization done. In others the chancroidal and secondary infection may be so extensive that circumcision, after cautery, is impossible for the reason that, after thorough cauterization, there is not enough healthy tissue for such procedure. In these cases two or more slits in the foreskin are made, the flaps are drawn away from the glans by tissue forceps or hemostats, the cautery is applied and the entire foreskin is burned off, the wounds healing by granulation. Such a condition was present in 2 of 54 cases. In two other cases untreated phagedenic chancroids had destroyed the entire glans penis. In these amputation was done by the cautery by retraction of the skin and superficial connective tissues, burning through these layers and then through the other penile tissues, procuring the urethra with forceps, and fixing it with sutures. The wound heals rapidly by granulation and renders extension of the chancroidal infection improbable. After cauterization or circumcision, thymol iodide, or other antiseptic dusting powder, with dry dressing is applied and the wound dressed in five or six days. If dressed sooner the danger of infection is more probable.

In cases in which primary syphilis is suspected, we have found it advantageous to excise the local lesion where it can be done without mutilation, and cauterize the area of excision. The excised ulcer is sent to the laboratory, where a small amount of clear serum is expressed for dark field examination. In this way a positive diagnosis of syphilis is made in the early stage before the Wassermann is positive. In not a few cases in the excised lesion one is able to

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demonstrate the treponema pallidum with much more ease for the examiner and comfort to the patient, than by repeated attempts to express a clear drop of serum and demonstrate it while the chancre is still intact. It is evident by this procedure there can be no pain, and a clear serum is much more easily obtained, hemorrhage being impossible. In addition to the dark field examination after excision and circumcision has been performed, the tissue may be stained by the Levaditi method or used after maceration for the infection of rabbits, for experimental purposes, by injection into the scrotum.

After a careful review of treatment in such conditions in various text books and later literature I have been unable to find a description of the above mentioned procedure. McDonagh[1] in his book published in 1916, writing on syphilis says, "excision of the primary sore should be practiced when possible, or when impossible should be cauterized or failing cauterization, mercurial ointment should be rubbed in until every trace of the induration has vanished." A. Neisser,[2] however, states that "syphilis becomes rapidly constitutional, chancre excisions made 8 hours after infection failed to prevent constitutional lues," hence it would follow that for this reason alone excision or cauterization would not be justifiable. We know, however, that a chancre may be a nidus for secondary infection resulting in suppurative bubo and deformity to penile tissue and a focus for the further dissemination of spirochetes.

McDonagh, writing of soft sore, says "great care must be taken if the sore is to be cauterized, since many cauterizing agents may set up a phagedena; the worst offender in this respect is diluted carbolic acid. The concentrated carbolic acid may be used with impunity, and the preparation that I nearly always employ myself is campo phenol." He further states "that if the patient has a tight foreskin and the sores cannot be reached and there is ever the risk of a phagedena ensuing, the foreskin should be slit up or even a circumcision may be performed." "Under no other circumstances should an operative procedure be undertaken. The wounds invariably become infected and phagedena often sets in. I once removed widely, and under the strictest antiseptic precautions, a soft sore which had barely been present for 48 hours and the whole of the foreskin immediately became infected and sloughed." McDonagh also states that "cauterization by means of zinc ionization quickly causes soft sores to heal, but special apparatus is required and takes up some time."

[1] McDonagh, Biology and Treatment of Venereal Diseases, 1916, p. 321.
[2] A. Neisser, American Journal of Dermatology, Feb., 1907.

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The apparatus required for cauterization is very simple, efficient and inexpensive. It consists of a Primus kerosene stove and 2 or 3 Mayo cautery irons similar to the soldering iron used by plumbers. It has been my fortune, after having this method demonstrated to me, to be stationed at a military post in which there were very few hospital conveniences. My cautery irons were made by the post blacksmith and were heated by a small alcohol stove of the type furnished by the medical department to such units as small as the regimental hospital. The operating room used need not be elaborate since in these cases we are dealing with wounds previously infected and the only instruments required after cauterization are hemostats, scissors, forceps, needles, and knife.

The patients from whom my experience was gained were, for the most part, West Indian negroes. Very few of these consider the venereal disease a serious thing in any form until they are incapicitated for work from such conditions as suppurating buboes and fever, severe pain upon micturition or inability to urinate, or a complicating acute epididymitis, hence operative procedure is necessary in the greater proportion coming under treatment.

In 33 cases the chancroidal infection was complicated with gonorrheal urethritis in 7, primary syphilis in 7, secondary syphilis in 2 and buboes in 10, two of which developed after cauterization and circumcision. The number of bubo complications after operation is apparently small, taking into consideration the existing pathological condition. In 7 cases of primary syphilis in which operative procedure was necessary, one was complicated with gonorrheal urethritis and three with bubo. In 9 cases gonorrheal urethritis with its complications was the principal manifestation, all of which required operative procedure on account of phimosis.

In one case, cauterization was not thorough and a slight chancroidal infection developed in a part of the incision, which later required a second cauterization. In another case, after primary cauterization without circumcision, phimosis developed to such an extent that it became necessary to circumcise later for the relief of this condition.

From date of circumcision and cauterization to that of discontinuance of dressings, in 54 cases, which include 2 circumcisions and 2 amputations by cauterization, the average time lost in hospital was 16.8 days plus.

The clinical records of six cases of chancroidal infection with phimosis in white soldiers, upon which cauterization and circum-

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cision was performed, have been reviewed by me for the purpose of comparison. These show an average of 10.7 days in hospital. These cases were not complicated by bubo and the local pathological process had not progressed to the extent generally found in the negro venereal cases. There were eight cases of chancroidal infection in negroes, in which the sores were accessible to cauterization. These were not complicated by phimosis or paraphimosis. They required an average of 9 days' hospital treatment.

Eleven cases of congenital phimosis without infection are here mentioned for the purpose of comparison. These cases, after circumcision, required surgical dressings for an average of 9 days; however, they could have left the hospital sooner had the treatment for circumcision been the only attention necessary.

One of the important features of the method is the freedom from pain, even after the most extensive cauterization and removal of marked phimosis by circumcision. Sedatives have not been required in any of this series. This is a marked contrast to most cases on which the dorsal or lateral slit is performed, or to most other operations on the genitalia. Cauterization if thoroughly done entirely destroys the local infection and if followed by circumcision the greater part of the pathological condition is removed, thus eliminating large areas of raw surfaces, which granulate slowly, with much pain and discomfort and result in a longer stay in hospital. Moreover, these areas are foci for the introduction of infection into the lymphatics and general circulation. It is evident that the dorsal or lateral slit alone, in chancroidal phimosis, does not destroy the infection and, in many cases, if a phagedena has commenced it will continue until marked deformity and mutilation to penile tissue results and in some instances is carried by the lymphatics to the groin.

In healed wounds after dorsal slit, deformity and mutilation is so marked that circumcision is required later. In this series the mutilation and deformity even in the worst cases was a negligible factor, except in the two requiring amputation, on account of phagedena which was present upon admission.

The complications, such as chancroidal extension to remote parts and bubo, are without doubt eliminated in the greater number of cases by the cauterization and circumcision since, as has been previously stated, only 2 of the 54 cases in the series developed bubo after operative procedure, and in none of them did a phagedena continue. This method also gives a clearer field for the local treatment of gonorrheal urethral infections.

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The only disadvantage is that in most cases a general anesthetic is required, and I may add here that we have found nitrous oxide very advantageous in cases requiring cauterization only. It is insufficient however for cauterization and circumcision at one sitting.

SUMMARY

The radical treatment of local venereal diseases, such as are presented in this article, by cauterization and circumcision is a marked improvement over the older methods for the following reasons:

1. Shortens the time lost in hospital and simplifies after-treatment, decreasing morbidity and pain.

2. Decreases the number and extent of complications.

3. Decreases deformity and mutilation, and in those cases in which the suspected primary lesion of syphilis is excised for dark field examinations, aids materially in the early diagnosis of syphilis.

4. Cauterization arrests instantly the spread of the phagedena.

The only disadvantage of this method is that in most cases a general anesthetic is required.

A PLAN FOR THE BETTER HANDLING OF VENEREAL DISEASES IN THE ARMY[1]

By Major LOYD THOMPSON, M. R. C.

The problem of handling venereal diseases in the army is a most serious one, and one which demands the earnest thought of the medical officer, as well as the most hearty coöperation of the line officer. It is not within the scope of the present paper to consider venereal prophylaxis, either in its medical aspects, or in its broader social aspects. It is with venereal disease after it has developed that the present discussion will deal.

At least 80 per cent of all venereal cases in the army, especially the chronic ones, are able to do duty and need not be confined in a hospital. It is only necessary for them to report for treatment at certain specified times, thus lowering the noneffective rate.

The secret of succesfully treating venereal disease, whether gonorrhea, chancroid, balanitis gangrenosa or syphilis, is to begin treatment at the very earliest possible moment after infection. It is obvious that in order to treat venereal disease scientifically a scientific diagnosis must be made. It is further obvious that a

[1] Just what the organization is at the camp at which Major Thompson is serving, we do not know, but we assume it must now be approximately what he suggests and that the essentials of his suggestions must be in operation at every camp. If such is not the case they certainly should be, indeed are required by regulations.—*Editor.*

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scientific diagnosis cannot be made by other than scientifically trained men.

It is therefore proposed that a "venereal dispensary" be established in a central location for each division. This venereal dispensary should be housed in a wooden building and should consist of the following:

(1) Laboratory, (2) treatment room for gonorrhea, (3) treatment room for chancroid and balanitis gangrenosa, (4) treatment room for syphilis, (5) record room, (6) store room, (7) office of director.

The laboratory should be completely equipped for the diagnosis of all venereal diseases and should include a dark field apparatus for examination for spirochetes, and equipment for performing the Wassermann test.

The equipment for the treatment room for gonorrhea should include all apparatus for treating both acute and chronic gonorrheal urithritis.

The treatment room for syphilis should be equipped for the administration of many doses of salvarsan daily. The equipment should include several 50-c.c. Luer type syringes, a gravity salvarsan apparatus, two operating tables, a water still, balances for weighing sodium chloride for normal saline solution, etc.

In the record room should be found a filing cabinet for records, desk, typewriter, etc.

The store room should contain sufficient drugs,—with the exception of salvarsan which should be supplied monthly—chemicals, etc., to last six months.

In addition to the venereal dispensary, each regimental infirmary of the division should have complete equipment for the treatment of acute and chronic gonorrheal urethritis and chancroid.

The personnel of the venereal dispensary should consist of the following: (1) Director of venereal diseases, with the rank of major. (2) Four captains or lieutenants as follows: one for gonorrhea, one for chancroid and balanitis gangrenosa, one for syphilis, one for laboratory. (3) Nine enlisted men as follows: one sergeant first class or sergeant as laboratory assistant, one sergeant as clerk, one private as second laboratory assistant, two privates to assist in the treatment of gonorrhea, two privates to assist in the treatment of syphilis, one private to assist in the treatment of chancroid, one private as orderly.

The method of employing the venereal dispensary would be as

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follows: The director of venereal diseases and other members of the staff should deliver lectures and hold demonstrations for all the medical personnel of the division on the proper methods of handling venereal diseases. Venereal inspection of all men who have been on pass during the past twenty-four hours should be held daily in each company or other similar unit. Orders should be issued by the division surgeon that all cases of urethral discharge and all cases of genital sores, no matter how trivial, should be reported at once without treatment to the venereal dispensary for diagnosis.

Cases which prove to be acute gonorrheal urethritis should be required to report to the venereal dispensary twice daily for treatment for three days, when they should be turned over to the regimental infirmary for further treatment. When the regimental surgeon considers them cured they should be referred again to the venereal dispensary for examination. Chronic gonorrheal urethritis should be treated either in the regimental infirmary or in the venereal dispensary, the director of venereal diseases deciding which is the better for each individual case.

Cases of uncomplicated chancroid should be treated similarly, except that a final examination by the venereal dispensary would not be necessary.

Cases of syphilis should be required to report to the venereal dispensary the day following diagnosis for an intravenous injection of salvarsan and an intramuscular injection of mercury, and should be required to report at specified periods for further treatment until the syphilologist considers them cured, or until he considers further salvarsan treatment inadvisable, and at intervals to be decided by the syphilologist for Wassermann tests.

The director of venereal diseases should make periodical inspections of the venereal equipment of the regimental infirmaries and determine whether or not this equipment is being properly used.

All cases of venereal disease with severe complications, such as gonorrheal epididimitis, gonorrheal arthritis, syphilis with manifest involvement of the internal organs, etc., which require hospitalization should be referred to the base hospital for treatment.

All cases of disease of the genito-urinary organs, other than venereal, and all cases of diseases of the skin, other than syphilis, also should be referred to the base hospital.

By following the above plan all cases of venereal diseases would be detected in the very early stages, except old, latent cases, and scientific treatment would be instituted, which would result in a large percentage of cures.

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While the above plan is intended particularly for the handling of venereal disease of troops while in training at the various cantonments of this country, a similar plan could be used with overseas forces.

THE WORK OF THE UROLOGICAL AND VENEREAL SERVICE OF THE BASE HOSPITAL, CAMP LEWIS, AMERICAN LAKE, WASH.

By Capt. ALEXANDER H. PEACOCK, M. R. C.

(With ten illustrations)

In the early days of our camp—before the establishment of the twenty-odd infirmaries now in operation—the embryo base hospital had to take care of a deluge of drafted men suffering with venereal disorders. As they came off the trains all were given the usual inspection, and those infected were stood aside and marched in squads up to the hospital. At the height of the draft eleven hospital wards were given over to these patients, and over 900 men received venereal inspection twice a day. The hospital buildings were not completed, so a large tent and canvas screens were converted into a dispensary. All day long there was a line of men awaiting their turn for inspection and treatment. According to the severity or stage of their infection, those with urethritis were grouped into three classes, acute, sub-acute and chronic stage, the A class receiving ½ per cent solution injection of protargol, B class 1 per cent, and C class 2 per cent; according to this division or groups they were also assigned to tent wards.

In the meantime, one of the hospital pavilions was secured and converted into a urological clinic, having in mind the easiest handling of a large daily clinic.

Fig. 1 shows the arrangement of the rooms, and is described as follows: (1) Office. Here all patients for urological and dermatological conditions report, having first gone through the receiving ward of the base hospital. Here their notes from their infirmaries or their transfer cards are examined and approved. In this office the Wassermann and urological records are kept, and reports telephoned to the infirmaries sending in their cases.

Acute and chronic urethral discharges are sent to room No. 2, where a slide is taken and the name registered. They are given a three-glass test and the treatment determined. For acute urethritis we employ injections of argyrol, 5 per cent aqueous solution twice daily—or when argyrol fails to give results and discharge is profuse, 2 per cent zinc sulphate is used. As the discharge lessens the in-

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flammation subsiding, irrigations are substituted, starting in with potassium permanganate 1:10,000, increasing to 6,000, finishing with various strengths of silver nitrate solution 1:10,000 to 1:5,000. After the condition has been reduced to a morning drop, with two negative smears for gonococcus, the patient is sent to room No. 3. This is the general examination and treatment room for chronic urological lesions. To this room also are sent men from the infirmaries who have been treated and want a final examination. Here his note is taken and on the reverse side stamped with rubber stamps. The three-glass test is made into sedimentation glasses. If shreds are present, the top urine is poured off and the remaining portion poured into a test tube to be sent to the laboratory for examination of the shreds for gonococcus. The man is put upon the table, meatus cleaned, then examined with a bougie-a-boule; if the meatus is too small a meatonomy is done. By this method we detect strictures, granulations and tender areas, as the urethra, when sore, spastically seizes the acorn. A large sound is then passed into the bladder to determine the caliber and conditions of the prostatic and posterior urethra.

Next the patient is turned over on his knees and a rectal examination made, palpating the prostate, and if possible the seminal vesicles. These glands are gently milked, and the character of the juice noted; same is secured on a slide for a gonococcus examination. The size and consistency of the glands are recorded. When these examinations give negative data, and there is a definite localized pain, an endoscope is employed, often revealing hyperemias and mild granulations; these are treated topically.

In all cases of long standing pyuria—without prostatis—where the urine fails to clear up on the usual irrigation treatment, a cystoscopy, catheterization of the ureters, X-ray, renal functional tests and bacteriological searches are made. There will be many surprises and revelations, for a large majority of cases will show lesions of the upper urinary tract, stones, hydro-nephrosis, tuberculosis, B. coli communis, streptococcus and non-functioning kidneys. A careful history will show that many go back, several years at least.

Room No. 4 is fitted up for cystoscopies, special tables being built. This examination is quite complete. For recording this data we use a rubber stamp.

The general survey of the bladder is made, noting all deviations from the normal, the capacity, the walls, the mucosa, tumors, ulcers, cystitis—localized or universal, the size and conditions of the ureter

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openings—the ease with which they are catheterized, presence or absence of urethral stricture or obstruction. It is quite a surprise to the uninitiated how many cases of chronic pyuria, on catheterization of the ureters, prove to be pyelitis and pyelonephrosis. We had many such lesions, which by bacterial examinations proved to be tuberculosis. We also encountered in the kidney pelvis the gonococcus, streptococcus, staphylococcus and B. coli. It is most important to determine the microörganism which is producing the trouble, and we should not rest with smears. I here pay high tribute to our bacteriological laboratory for their able assistance under great difficulties. Cultures of the catheterized bladder and separate kidney urine are made in all cases of pyuria, and if these prove negative, guinea-pig inoculations have cleared up a number of doubtful infections, death from tuberculosis resulting in 14 to 17 days.

In addition to determining the bacterial flora present, functional tests are made routinely on all kidneys catheterized; we use the saturated solution of indigo carmine and sulphonephthalein, noting the time appearance of the dye in the catheterized urine, and also the percentage of dye eliminated in the first 15 or 30 minutes. In comparing the two kidneys, a very accurate estimate can be made when we take in addition the amount of urine excreted, a comparison of each kidney urea index, the presence or absence of casts, pus cells and bacteria. To complete our examination, blood for a Wassermann is collected just before we give the phthaline intravenously, and we have found a number of unsuspected cases of lues. After the functional tests are completed the patient is sent to the X-ray laboratory, with the catheter still in place; there a picture is made of the ureters, and a pyleogram, using 10 per cent thorium. This gives us the capacity of the kidney pelvis.

To go back to our chart or diagram: Room No. 5 is equipped for the skin and syphilis clinic, the taking of bloods for the Wassermanns, the administering of salvarsan and the mercurial injections. There is a large daily attendance, morning and afternoon. On Tuesday and Friday nights, at 6 o'clock, the classes for mercurial injections meet; these will average 45 to 75 per night. They are given a course of 8-10 salvarsans and 15-25 mercurial injections. All treatment is Wassermann controlled. Room No. 6 is devoted to laboratory examinations, urinalysis, the dark field examination for the spirocheta pallida, and smears stained for B. coli, gonococcus and tubercle bacillus. This laboratory was installed, as the specimens sent to the general laboratory require several days at least for

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a report to get back, due to the great volume of work they must run through. Room No. 8 is used by our illustrator, and as an extra office. Room No. 9 is a small emergency and recovery ward, to be used after cystoscopic examinations and the administration of salvarsan. Room No. 10 is a store room, Room No. 11 quarters for ward attendants. Room No. 12 is a waiting room.

The relationship of the urological clinic of the base hospital and the regimental infirmaries is a very harmonious one. The acute urethral discharges are treated by the latter; the chronic cases, those with complications, strictures, prostatitis, cystitis, and those for final discharge, are handled by the clinic. No case is treated or examined by the clinic unless the soldier brings with him a note from his regimental surgeon, specifically requesting treatment or examination.

Our dispensary records are kept in large ledgers, as cards get lost and the records become broken. One ledger is kept for the acute urethral cases, noting the bacteriological smears and recording each irrigation or injection given. From this ledger we can tell instantly just what injection a soldier has had, on what days, and how many. One ledger records all venereal patients in the hospital, with date of admission, date of discharge and diagnosis. One ledger is kept for massages and sounds, giving the sizes and dates; one ledger for a complete urethral examination, as per Fig. 2; one ledger for the cystoscopic data; one ledger for skin cases, and prescriptions for same; one ledger for all the lues, giving stage, Wassermann reaction, city where infected and date of same.

Since the base hospital opened last September, to the present date —just six months—there have been admitted to the venereal wards the following patients:

	Diagnosis	*Total No. cases*	*Average days in hospital*	*Total days in hospital*
1	Gonococcus, acute	675	11½	1,762
2	Gonococcus, chronic	265	16	4,235
3	Epididymitis, G. C.	81	32½	2,637
4	Stricture, G. C.	15	12	186
5	Prostatitis, G. C.	23	23	530
6	Arthritis, G. C.	60	24	1,430
7	Syphilis	240	31	7,556
8	Chancroids	131	20	2,614
9	Enuresis	18	26	497
10	Renal infections	7	28	196
11	Hydrocele	15	30	441
12	Varicocele	79	20	1,464

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FIG. 1.—PATIENT REPORTING AT OFFICE.

FIG. 2.—IRRIGATOR STANDS. MAIN ROOM.

(To face page 190.)

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FIG. 3.—CATHETERIZATION OF KIDNEYS—FUNCTIONAL TESTS.

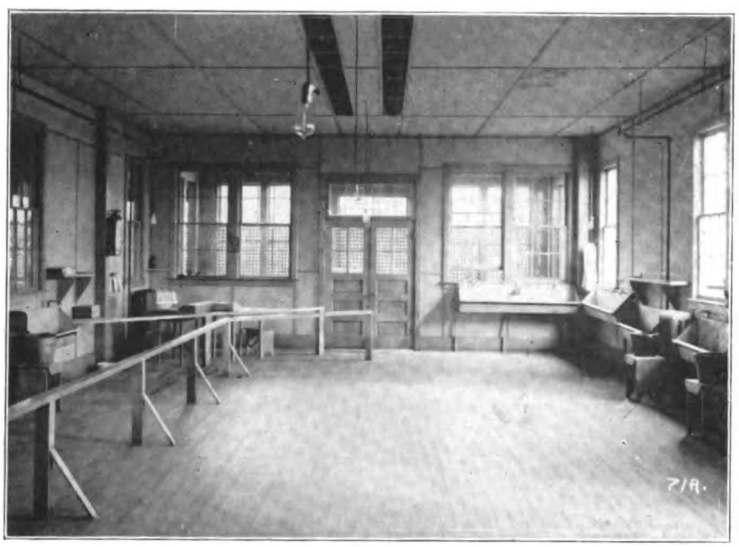

FIG. 4.—ENTRANCE END. MAIN TREATMENT ROOM.

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FIG. 5.—URETHRAL EXAMINATIONS—UROLOGIC.

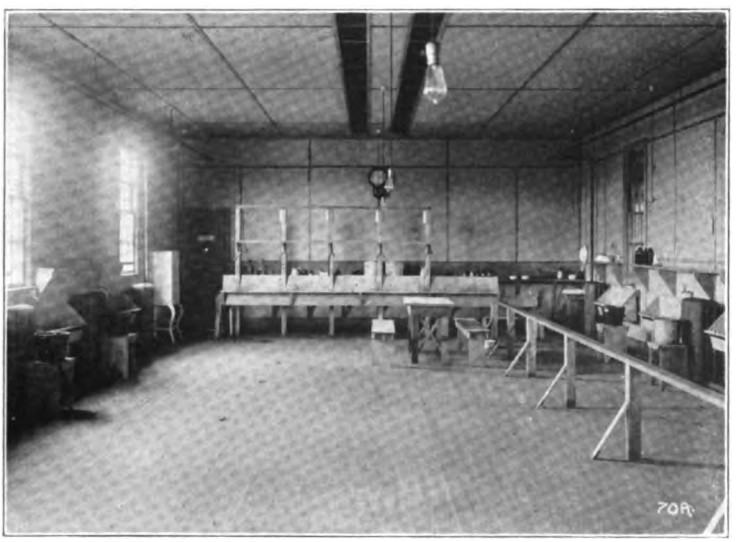

FIG. 6.—MAIN TREATMENT ROOM. IRRIGATING END.

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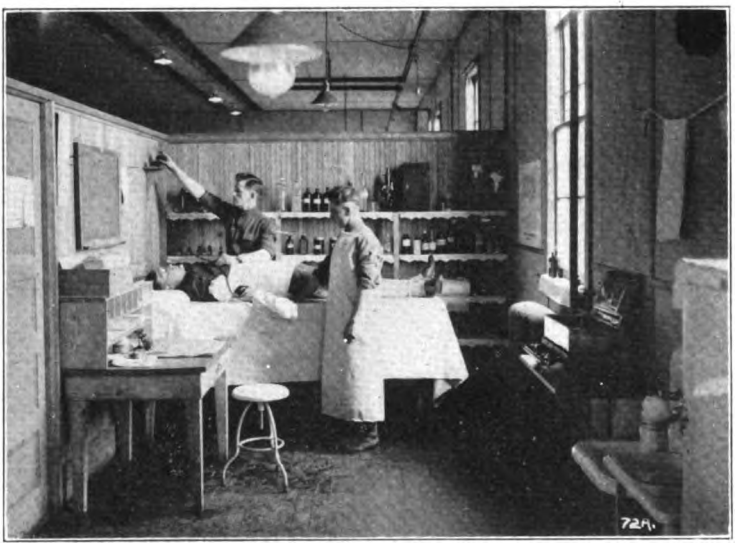

FIG. 7.—ADMINISTERING SALVARSAN.

FIG. 8.—UROLOGICAL RECORDS.

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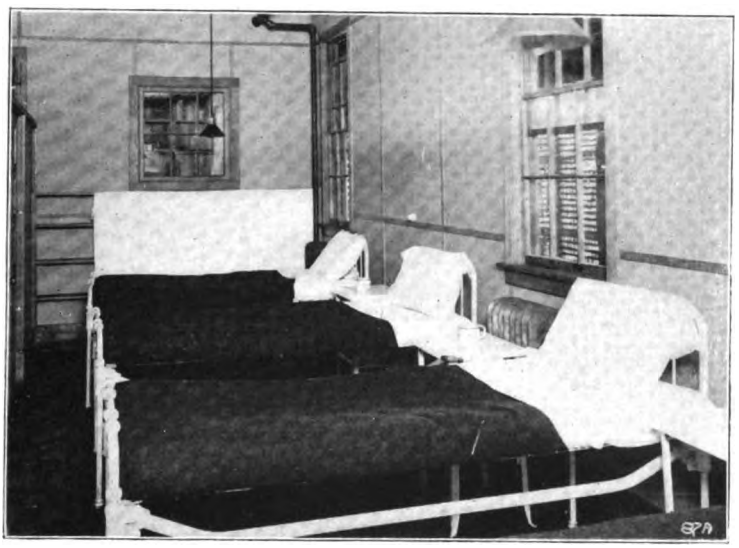

FIG. 9.—RECOVERY ROOM.

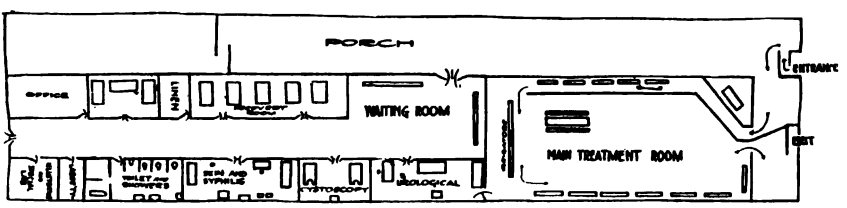

FIG. 10.—UROLOGICAL AND VENEREAL CLINIC.

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The above figures apply solely to patients admitted, and do not take in the out-patient's department. The first draft of 40,000 men brought these infections from civil life; many of them were acquired with the expectation of rejection from the service. These men were well gone over, the incurable arthritis and tertiary lues were discharged, and the balance of them cleaned up. Many of them were made gonococcus-free and Wassermann-negative for the first time in years; they gained in weight and have improved morally. This draft into the army has done them a world of good, for no soldier can leave the cantonment until his urethra is gonococcus-negative and had a full luetic treatment.

The shortest time in the hospital for an acute case was one day, and the longest 149 days, but neither of these cover only the period of the infections; the average time for an acute case was 11½ days, and for a chronic case 16 days. By that we mean entirely cured and ready for duty.

In chronic urinary infections the most important thing of all is the ability to locate the structure involved and the infectious agent—to be a good trouble locator. When a piece of machinery gets out of order we consult the machinist who can most accurately detect the disarrangement, and this holds good with disorders of the urinary tract. In private life, I have had sent to me many, many patients with pyuria, who had been treated for months with vesicle irrigations, and found upon examination a pus kidney—many of them tubercular—or a hydro-nephrosis. All these months of treatment did no material harm, but cost the patient lots of lost time and money. Again, a patient will be treated for many weeks with urethral injections when a stricture, posterior urethritis, prostatitis or vesiculitis is present; injections never would affect a cure in these.

It is a common experience to see cases of pyuria and cystitis diagnosed as chronic gonorrhea, when the infection is one of the coli or paracoli group. And this leads me to mention another very important factor: Always determine the bacteriology of the inflammation present; make it a routine practice, using smears of the centrifugal sediment, or cultures, or pig inoculations; for, as you know, there is some microörganism at the bottom of 95 per cent of these disorders. This often means a painstaking search, but it is the only proper way to make an accurate diagnosis, and is a big factor in the subsequent treatment, as each organism calls for a different line of attack. For example, the B. coli is practically

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uninfluenced by local treatments as irrigations; it is usually an infection of the intestinal as well as entire urinary tract, and is best attacked by urotropin and autogenous vaccine. On the other hand, the tubercle bacillus is not the least affected by urotropin, and requires either surgery or tuberculin. The gonococcus is likewise but little retarded by urotropin; this diplococcus we attack with sedative oils, diuretics and local treatment—either very mild astringents or silver nitrate, or one of its many modified albuminates. These produce an outpouring of the leucocytes, and we witness a phagocytic action. And in them all must we bear in mind the pathology of the case before us—as, for example, the old chronic urethra infected many times before, and whose mucosa has been toughened by former irrigations and treatments, will often clear up magically of a new infection, if seen early, by the use of a strong solution of silver nitrate, whereas the acute virgin infection, with a tender urethra, antero-posterior involvement with hematuria, and a greatly thickened urethra from periurethral inflammation, should never be treated by injections or irrigations. So always must we see our pathology and know our bacteriology.

One of the most troublesome complications we have to deal with is epididymitis. You will recall the histology of this body—how the vas comes through the inguinal canal, descends to the lowermost point in the scrotum, expanding into a maze of fine convolutions called the globus minor, passes upward to form the body of the epididymis, and then another greatly convoluted mass at the top, called the caput or globus major. From here, fine tubules enter the rete testis. The portion most always involved is the globus minor, and the pathology shows greatly odematous columnar epithelium, the lumen of the tubes being filled with a thick mucoid secretion. It is not unusual for these tubules to become blocked and pus gather to form a small abscess. These are the types which have been called the male pus tubes. In the early days of the hospital, gonococcus epididymitis was treated by rest in bed, either heat or cold (usually the latter), suspension or strapping and belladonna ointment. Resolution would finally take place, but the patient had many hours of acute pain; also many of these patients, after weeks in the hospital, return to their organization—only to come back with a recurrence. In private life an epididymitis is a very different problem from an epididymitis in the soldier. The latter must live the life of an athlete, and his very active physical existence is the best thing in the world to bring back or light up his chronically

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infected epididymis. This leads naturally to surgical treatment. Now, the routine measure is epididymotomy; this applies to the acute, virgin cases. The pubes are shaved and surgically cleaned; the patient is given primary anesthesia. The indurated mass is pointed upward—an incision of the skin and facia—then the globus minor itself is split from end to end of the tumefaction and a search for a pocket of pus is made with a blunt probe. The edges of the skin are now sewed to the edges of the cut epididymis with plain catgut, and a dry dressing applied. No drain is used. The scrotum is strapped upon the pubes; this is not disturbed for a couple of days.

In chronic recurring cases we do an epididymectomy, or excision. This, too, is a simple operation. After incising the skin, the enlarged epididymis is delivered through the incision, and the deep facia is dissected off it; usually adhesions are encountered. The globus minor is now dissected out with a sharp scalpel, leaving a clear, raw base. The edges of this base are drawn together with a continuous suture of plain gut; the deep facia is now closed with interrupted silkworm gut sutures in the skin. The dry dressing is not disturbed for several days. This procedure does away with all recurrences. It is surprising how many of these epididymitises contain foci.

Another of the interesting complications we have to deal with is stricture of the urethra, especially with those of the membranous portion and of the filiform caliber. In the hospital and out-patient clinic we have had about fifty, and we have our first stricture yet to cut, as all were dilated. The method has been to fill and distend the urethra with oil, liquid petrolatum. It is better than glycerine, which is hydroscopic, and therefore has a tendency to contract the urethra. After holding the oil in five or ten minutes, whalebone bougies are inserted and one finally worked through the stricture. This is then fastened to the meatus and the patient allowed to wear it 24 to 48 hours. At the next sitting a rat-tail bougie is inserted; these are used every second or third day. As the caliber increases, sounds are screwed on the rat-tail, which guides the sound into the bladder. This method has been very satisfactory, and is far superior to a urethrotomy, either internal or external, which, if neglected, results in traumatic strictures ultimately.

There are many more interesting features, but I will rest with these.

Our staff has consisted of from two to four officers, most of the time but two, and ten corps men; the latter were carefully chosen

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and tried out, and have become very expert assistants under the training given them. The large amount of work performed would have been quite impossible without them, and I cannot commend their skill and faithfulness too highly.

In our out-patient department we carry a large number of clinic cases for the infirmaries. Some 25,569 injections alone were given in our first six months of service.

Other treatments administered were as follows:

Wassermanns taken.....	1,183	Salvarsan injections.....	998
Cystoscopies.....	126	Mercurial injections.....	1,507
Minor operations.....	55	Prostate massage.....	1,682
Sounds passed.....	834	Urethroscopes.....	11
Circumcisions.....	185	Massage (special body).....	590

UROLOGICAL AND VENEREAL REPORT

Cystoscopic data	*Urological data*	*Syphilis data*
(1) Catheterized bladder urine.	(1) *Urine.*	Date of infection.
(2) Bladder.	(a) cc.	Where contracted.
(1) Capacity.	(b) cc.	Prophylaxis.
(2) Walls.	(c) cc.	Line of duty.
(3) Mucosa.	(2) *Meatus.*	Primary.
(4) Ulcers.	(3) *Bougie-a-boule.*	
(5) Tumors	(4) *Sound*	
(6) Foreign bodies.	(5) *Prostate.*	Secondary.
(3) Right Ureter-Kidney.	(6) *Prostatic juice.*	
Orifice.	(7) *Seminal vesicles.*	
Amount.	(8) *Diagnosis.*	Tertiary.
Time appearance phthalein.		
Percentage phthalein.		
(4) Left Ureter-Kidney.		Previous treatment.
Orifice.		
Amount.		
Time appearance phthalein.		Wassermanns
Percentage phthalein.		
(5) X-ray.		Present manifestations
(6) Wassermann for lues.		

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PAINFUL ABDOMINAL SCARS

By Major ERIC P. QUAIN and Captain CARL EGGERS
Medical Reserve Corps, U. S. Army.

PAIN in and about an abdominal scar, often deep seated or radiating to the back, dragging sensations, accumulation of gas and sometimes constipation, are symptoms of which a certain percentage of patients admitted to our hospital complained. Most often the scar in question was that following an appendectomy, sometimes a clean one, but more frequently a suppurative appendicitis that had been drained for some time. One patient had been operated on for duodenal ulcer and several for inguinal hernia. The patients usually stated that they had pain and were unable to drill or do any other heavy work.

The number of such cases that have presented themselves in the last few months has been enough to warrant careful consideration of the condition. As it is our duty to save men for the service, to make them physically fit for the stress of warfare, and at the same time not do them an injustice, it is apparent that such patients must be given considerable attention. Large ventral hernias with distinct sac formation are left out of our consideration because they are infrequent in males of military age and, if present, would probably rarely get past the draft board.

Up to date no patient admitted to our hospital with the diagnosis of "incisional hernia" or "painful scar" has been discharged from the army. All have been carefully studied, the majority being returned to duty after examination and advice. Seven have been subjected to an operation and have since been sent back to their command.

After admission these patients were put to bed, a laxative was given, and a light diet prescribed. By means of this treatment their muscles relaxed and all strain was relieved, thereby facilitating examination and study. The X-ray was frequently called on for assistance.

The question to be determined is: In which cases are the symptoms complained of due to actual pathologic changes and in which cases are they of neurotic or "slacker" origin? The impression we have gained is that many of the men complain of pain in the scar, thinking it might excuse them from part or all of the service. A scar is a visible and convenient physical sign to carry for this pur-

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pose. The disability papers had already been started in a number of these patients. It is not to be denied that actual pain may have been present in the majority, if not in all these scars, but the pain is often deliberately magnified in importance for the reason stated.

Various courses have been followed to convince these patients of the futility of their attempts, and all those who have not been operated on have been returned to their commands for duty. Some were easily convinced and satisfied to return to duty when informed that the little pain they may have had was not of serious consequence and under no circumstances would earn them a lighter service. Others were given the alternative of going back to full duty or submitting to an operation which would be followed by full duty. They were informed that any complaint from the same cause would at once cause them to be sent back to the hospital for operation. One patient who chose to go back to duty returned later, and was completely relieved from symptoms by operation. When we could reach the conclusion that actual anatomic pathology served as basis for serious complaint, we advised operation at once. On account of the interest attached to this condition we shall present the following cases in detail:

Case 1. G. F. B. Operated on for chronic appendicitis November 1917. Did full duty as member of officers' training school until January 16, 1918. On that day he suddenly felt a severe pain in the region of his scar while jumping across a trench. He vomited several times. Treated at base hospital for short time with rest in bed and then went back to duty. Readmitted February 11, 1918. Complained of pain in scar radiating around to back. Bowels move daily. Says he is unable to drill. Has a scar of a McBurney incision well healed; no hernia; scar and surrounding region very sensitive. He refers pain from this area to the lumbar region. No sensitiveness in kidney region or over muscles of back.

Operation February 19, 1918. Excision of scar. Unusual amount of scar tissue. Peritoneum opened. Omentum found adherent in two places. It was found that the omentum had passed through the peritoneum and formed two little herniae in sacs under the muscles. This part of the peritoneum was excised and it was then mobilized enough to allow a good closure. Abdominal wall sutured in layers.

While still in bed, patient stated that all his pain had disappeared. Wound healed primarily. He was returned to duty March 14, 1918, entirely relieved.

Case 2. P. W. S. Admitted March 8, 1918, complaining of pain in and under his scar, and of constipation. Says he is unable to sleep. No vomiting. He was put to bed and kept at rest. He was found to be

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infected with hookworm and this was considered a cause of his symptoms. However, no relief followed the treatment for them. Patient had a well-healed scar of a McBurney incision. This was tender to the touch, and there was in addition deep-seated tenderness.

Operation March 25, 1918. Median incision 3 inches long below umbilicus. No omental adhesions. A loop of small intestines was found suspended from the lower part of the scar by a short, thick vessel carrying band, producing twisting of the gut at this point. This band was doubly ligated and divided and the stump covered with peritoneum. Abdomen closed in layers. All symptoms disappeared promptly. Patient was returned to duty April 9, 1918, entirely relieved.

Case 3. B. F. L. Operated on for appendicitis early in 1916. Was drained in bed about six weeks. Has had some pain ever since. States that he is unable to drill or do any hard work on account of pain and dragging.

He has an irregular broad scar, forming but a thin layer over the abdominal contents. Scar sensitive. Gurgling of intestines under that region. In the upright position there is some bulging of the scar.

Operation March 1, 1918. Excision of scar. Numerous adhesions of omentum and gut found. Some of these were separated. Appendix was found surrounded by adhesions. It was removed in the usual way and the stump buried. Edges of the various layers were freshened and then carefully approximated. A good, firm abdominal wall obtained. Recovery uneventful. Returned to duty from hospital March 19, 1918, free of symptoms.

Case 4. K. L. W. Was operated on for acute appendicitis September, 1916. In bed with drainage several weeks. Has had a drawing pain in the wide scar, located over the lower part of the right rectus. The pain has become worse since he entered the service.

Operation February 28, 1918. Excision of entire scar. Peritoneum opened. Appendix found embedded in adhesions. There were also numerous adhesions of omentum to the scar. They were divided, appendix removed, and stump buried. Affected edges of peritoneum were removed and the new borders united by continuous suture. Muscle, fascia and skin closed by interrupted layer sutures. Recovery uneventful. Returned to duty three weeks after operation free from symptoms.

Case 5. E. J. R. Was operated on four years ago for what he says was a perforated duodenal ulcer. He complains of pain and distress in upper abdomen and dragging pain on exertion. Claims to be unable to drill. Examination revealed a well-healed McBurney scar and a large, irregular, broad scar over the upper right rectus, about 4 inches long. Patient states that wound was drained at first operation. There is no distinct hernia, but in the erect position there is slight bulging. Patient complains of tenderness on pressure.

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Operation March 4, 1918. Excision of scar. Few adhesions of omentum. Stomach and intestines free. No sign of an ulcer found. No gastro-enterostomy present. Peritoneum, muscles, fascia and skin sutured in separate layers after freshening their edges. Convalescence uneventful. Returned to duty free from symptoms March 26, 1918.

Case 6. S. G. Was operated on for appendicitis September 23, 1917. Wound drained and healed slowly. In bed two months. Ever since operation has had pain in scar and entire lower right abdomen. While drilling, a week before admission, a small opening formed in lower part of scar and discharged pus.

We found a large stretched-out appendiceal scar, in the lower part of which was asmall ulcer and a fistula a inch deep. No discharge at present.

Operation March 22, 1918. Excision of scar. Fistulous tract was found to lead to and into the tip of the appendix. Latter removed and stump buried. Adhesions were separated. After freshening of the edges the abdomen was closed in layers, leaving a small drain.

The convalescence was without incident except that there was a rise in temperature to 102° the day after operation. Cause not found. March 26, 1918, drain removed. No retention of pus. April 10, 1918, wound firmly healed. Has no pain or other complaint.

Case 7. R. F. Was operated on January, 1916, for appendicitis. Was drained and stayed in bed about six weeks. Has never been well since. Complains of pain in scar and in right abdomen radiating to back. States that he has had four distinct attacks of severe pain accompanied by vomiting during these periods. Last attack necessitated attendance of a physician.

Patient had a large, irregular puckered scar over lower right rectus. It was thinned out and in places very hard. In the erect position there was some bulging. Pressure on and about the scar caused pain. Fluoroscopic examination not very satisfactory because patient so tender that proper manipulation was impossible.

Operation April 9, 1918. Excision of scar. Peritoneum opened. We found numerous adhesions of caecum and one of the ileum to abdominal wall. All were divided and denuded surfaces covered. After freshening edges abdomen was closed in layers. He had complete relief.

This case shows that good results can be obtained although the condition does not look at all promising at operation. By operating radically and reconstructing the layers nearly to a normal condition, excellent result was obtained.

From observation of the cases here presented we can say that the causes producing painful scars may be divided into four classes: (1) Simple adhesions of omentum or gut to the partial peritoneum under and surrounding the scar. (2) Small submuscular hernias

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of omentum through the peritoneum. (3) Thin, stretched-out scars with hernia-like bulging of the abdominal wall, together with numerous adhesions. (4) Retention of appendix and adhesions following drainage of an appendix abscess.

To these may be added a fifth class which we have not been able to clearly demonstrate in this service, cases in which nerve fibers are caught in the scar and produce pain. To prove this condition, the abdominal zone containing the nerves leading to a scar can be injected with local anesthetic and in the positive cases all pain will cease. Excision of the scar will bring about a cure.

The question may be asked: Could any of the conditions found at operation have been prevented at the time of the first operation? Were they due to faulty technique? This question may be answered in the affirmative when we consider Cases 1 and 2. The small submuscular hernia was most likely due to improper closure of the peritoneum allowing prolapse of omentum. In a clean case, this should not have occurred.

The adhesions of the small gut by a short, firm vascular band in Case 2 was so evidently due to suturing it to the abdominal wall that this must also be considered as due to faulty technique.

In regard to the drainage cases, it is difficult to judge. They may have been in such precarious condition, and the infection so virulent, that saving the patient's life was the primary consideration. The infection may have invaded the tissues and caused such damage to the abdominal wall that permanent pathology was inevitable.

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AN ENGLISH ORTHOPEDIC HOSPITAL—FOR THE TREATMENT OF CHRONIC DISABLED SOLDIERS AND SAILORS

By 1st Lieutenant CHARLES M. ALLABEN
Medical Reserve Corps, U. S. Army

(With eight illustrations)

ON THE third of September, 1916, the construction of a hospital for the treatment of chronic orthopedic cases was started at St. Helens, Lancashire, England, and from an old and spacious glass grinding shed there has been developed The Pilkington Special Hospital, which at the present time is probably the most fully equipped and most up-to-date hospital of its kind in the United Kingdom, if not in the world. James R. Kerr, Ch.M. (Glasgow), who, early in the war, voluntarily joined the French Red Cross, after serving fourteen months as surgeon-in-chief at a French war hospital came back to organize the hospital in question and to take the position of chief surgeon. Many details of the hospital were arranged by Dr. Kerr while he was still in France and in touch with such institutions as the Grand Palais, Paris. It has been the writer's good fortune to have been stationed at this hospital for several months, and he is able to testify from direct experience that the results of treatment there obtained are truly wonderful.

An excellent feature of the institution is that no more patients are admitted than can receive treatment, so that each patient receives daily treatment and not, as so often is the case, only now and again because there are more patients than can be treated in a given time. At present there are 140 in-patients (soldiers not yet discharged), who occupy the hospital beds, and over 200 out-patients (pensioners) who live out and come in for treatment. In a few weeks a new building, which will accommodate 150 or more patients and which is connected by a corridor to the main hospital, will be opened as a residence for pensioners. By a carefully arranged time-table nearly 1,000 patients can be treated daily.

When a new patient is admitted for treatment he is examined by one of the medical staff, his history is recorded, electrical reactions taken, sensations tested, and careful measurements made of his deformity. These are kept for future reference. If surgical interference is indicated, he is either scheduled for operation in a few days, or he may be put upon physiotherapeutic treatment if such would be beneficial before operation. Most cases, however, com-

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mence the following day with whatever measures of physiotherapy are thought necessary. A card with recommendations for treatment is sent to the registrar's office where a time-table is arranged for the patient.

The types of cases treated are as follows, based upon one year's report taken from the records of in-patients: Lesions of brachial plexus, 9 per cent; median nerve, 13 per cent; ulnar nerve, 12 per cent; musculo-spiral nerve, 10 per cent; sciatic nerve, 9 per cent; ext. popl. nerve, 4 per cent; post. tibial nerve, 4 per cent; compound fracture with adhesions, 15 per cent; compound fracture with mal-union, 7 per cent; compound fracture with nerve injury, 14 per cent; peri-articular adhesions, knee, elbow, etc., 13 per cent; internal derangement of knee, 3 per cent; trench feet, flat feet, etc., 4 per cent; amputations, 2 per cent; cerebral wounds with paralysis, 2 per cent.

In order to gain a concise idea of the departments of which the hospital is composed it will be an aid to group them as follows: Departments of (1) Surgery: (*a*) Operative, (*b*) Minor. (2) Radiography. (3) Physiotherapy: (*a*) Electro-therapy and Massage, (*b*) Hydro and Thermo-therapy, (*c*) Mechano-therapy, (*d*) Remedial Gymnastics. (4) Plaster Splints and Casts. (5) Education and Personal Work: (*a*) Curative workshops, (*b*) Horticulture, (*c*) Studies, (*d*) Sports.

Surgery.—An operating theater equipped with special orthopedic fixtures and the best and most modern instruments, especially for orthopedic work, affords a place to perform whatever surgical operation presents itself. The most common operations done here are neurolysis, nerve suture and transplantation, removal of sequestra, bone transplantation and fixation, tendon suture, transplantation and fixation, removal of foreign bodies, etc. All except bed patients, requiring dressing, are attended to in a modern aseptic surgery, a recent feature of which is the installation of an ozone generator for use in the treatment of septic wounds.

This department deals principally with diagnosis, radiographic and fluoroscopic, both from a surgical and physiotherapeutic standpoint. No expense has been spared to have the best apparatus obtainable. It is equipped with an American high frequency transformer and the latest French radiostereometer, as well as an English stereoscopic apparatus. Tubes come from the U. S. A. The other apparatus is of English design. Most excellent work is done in this department, which is under the direct supervision of a

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Frenchman who came to England solely for that purpose. He takes all exposures and develops all of his own plates, the result being that unusually clear and distinct radiographs are obtained. Great care is taken to get detail of the texture of the bone in order to show the degree of bone affection. Then by the use of the radiostereometer the minute portions are brought out and breadth and thickness are easily calculated.

Physiotherapy—Electrotherapy and Massage.—One large room 48 by 78 feet is given up to this department. The room consists of four compartments which are separated by breast-high partitions. A separate door enters each compartment and a central aisle connects the four. Each compartment contains twelve beds, each with a complete electrical apparatus, galvanic and faradic. At each bed is a graduate masseuse, and electrical treatment and massage are given at each bed as required. Electrical treatment, consists of galvanism, faradism, ionization, etc., as generally used. Forty-eight patients can be treated every half-hour.

Hydrotherapy and Thermotherapy.—In a new addition, but recently opened, the entire ground floor is given up to treatment with water and hot air. There are two large tiled pools, 20 by 36 feet. In one is water at 90° F. to 100° F., through which bubbles of compressed air pass up from the bottom. Along the two sides patients sit on tiled seats with the water to their necks. The other pool contains cold water (70° F. to 78° F.). In both pools the heat of the water is regulated by steam. There are six especially designed arm baths, each accommodating six arms, through which rushing water, driven by motor pumps, passes continuously. There are also two small arm baths and one whirlpool arm bath, each accommodating two and three arms respectively. The leg baths consist of twelve whirlpool baths, cast in blocks of four, and one separate whirlpool bath, each for two legs. All of the above arm and leg baths are supplied with compressed air, the bubbles of which, with the swirling water, keep up a gentle stimulation of the skin.

Hyperemia, caused by the hot water with the aid of the stimulating effect of the mechanical action of the compressed air bubbles against the skin, is the chief claim made for hydrotherapy as practiced here. Using the phrase of Prof. Woods Hopkinson the "skin-heart" is stimulated into action, thereby not only bringing relief of pressure to the heart, but bringing the affected part into a suitable condition for further treatment by physiotherapeutic methods.

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In addition to these baths are two contrast baths on a large scale, one hot and the other cold, side by side, in which trench feet are treated by changing the feet from one bath to the other at five-minute intervals. The thermo section of this department is equipped with specially designed air appliances permiting gentle currents of air, heated electrically, to surround an injured part with a dry atmosphere, at say 250° F.

Mechano-therapy.—This department occupies a room 70 by 130 feet in which there are seventy pieces of apparatus for the treatment of patients by mechano-therapy. Twenty of these machines are of the weight and lever type and might be designed as multiarticular apparatus, that is, by the attachment of different accessory parts different joints may be treated. These machines are used mostly for fingers, wrist and ankle joints. Extension, dorsiflexion and flexion are the movements brought into play. The other fifty are made to elicit the particular movement of certain joints and include fourteen different types of machines to obtain elevation, rotation and circumduction of shoulder, elbow flexion and extension, forearm supination and pronation, flexion, dorsiflexion and rotation of wrist, hand and finger flexion and extension, hip rotation, abduction, adduction, flexion and extension, knee flexion and extension, ankle flexion, extension and rotation, bringing in eversion and inversion, finger bars, etc. With a few exceptions, once the apparatus is applied and adjusted, after a few instructions, the patient, making his contribution of active effort, is able to "carry on" under the surveillance of an attendant. The adjustment of the machines does not allow him to overdo the matter. Nearly all of these devices are of French pattern and were personally selected by Dr. Kerr at Paris. Results obtained in this department remove fear of injury to patients and confirm belief in the immense value of mechanotherapy.

Remedial Gymnastics (or remedial physical training)[1].—Physical training plays a very important rôle in the treatment of chronic orthopedic cases. The instructor in charge of this department is a college graduate who has an intimate knowledge of anatomy and has made a special study of the anatomical position and action of the muscles, joint structure and action, and nerve distribution. This is obviously essential for work of this kind. The work given here is

[1]It is the opinion of the writer that the words "gymnastics" and "gymnasium," though not misnomers, are misleading to the mind of many prospective patients, before they take up the work. It tends to convey visions of parallel bars, trapeze and other strenuous gym work, and also army "setting up" exercises, of which they think they have had enough.

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based upon localized remedial training, together with Swedish and general gymnastics to build up the patients' general physique. Recently the treatment of flat feet by the use of remedial exercises as set forth by Lieut. Col. G. H. R. Gosman, M. C., U. S. A., and Lieut. H. P. Perry, M. R. C., U. S. A., in the January number of THE MILITARY SURGEON, was taken up in this department.

Plaster Splints and Casts.—The studio plays no small part in the treatment of both in-patients and out-patients of the institution. Two days of the week and in the summer months for four and five days, an accomplished sculptor, who is professor of modelling and sculptural anatomy at the Manchester School of Art, comes to the hospital. Plaster casts in plaster of Paris are taken from accurate moulds of the disabled parts. Certain casts are made complete and kept as permanent records and are useful in guiding treatment. Other casts are taken, for example, from the palmar or dorsal side of a drop wrist, when the wrist is held in the position desired to be kept, and upon these casts are made reinforced plaster of Paris splints which must necessarily fit accurately to the disabled parts. Through careful experimentation very light and durable splints are now made in this way. Bony deformities are modelled from the patient's radiograph to be kept as permanent records. Recently the casts of certain cases with trophic ulcers and particularly ugly scars have been painted in natural colors, from life, to be kept for future reference.

Education.—The curative workshops are divided into several departments, the chief being elementary carpentry and wood turning. Here certain patients under the guidance of a trained instructor are taught the use of wood-working tools. Some very good work has been turned out by patients with one or both hands crippled. Special tools are constructed to fit certain deformed hands. Another section of this department is that of fretwork. This not only gives a use for both hands but also disabled feet, as the machine is driven by a foot pedal. In another section men learn to draw and paint in water colors and in this way bring disabled fingers and hands into action. Coördination of the finger movements must also come into play here. Certain patients are also shown and taught the art of "throwing" clay. This, like the fretwork, brings into action both hands and one foot. With the idea of foot movement in mind, a rather respectable clay throwing wheel was made in the workshop from an old sewing machine.

The writer believes the various forms of work to be of much val-

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ue, for not only does the patient keep his mind busy, learns something new and brings disabled parts into useful action, but the interest of the patient being fixed upon the object he is creating, his attention is distracted from his disabled member, and often a greater degree of movement takes place than if he were thinking of the discomfort, not what he would experience, but what he expects to experience, when a joint is moved beyond what he has seen it moved before.

Horticulture is considered as a recreation as well as an education. Those patients who so desire are allowed to work at gardening during the season, upon a large plot of ground adjacent to the hospital. Not only is there a considerable amount of garden stuff produced but the use of the spade, barrow and other garden implements provides a certain amount of curative treatment for disabled hands and feet, as well as a stimulus to mind and body.

Studies—Mental Education and "Mirror Writing."—This department is carried on by Dr. John G. Kerr,[2] the superintendent of the institution.

Through a coincidence he discovered from a patient, who had lost the use of his right hand, that the patient could not write "overhand" but by the use of a reversed carbon sheet under his writing paper could reproduce a letter on the reverse side of the sheet which was quite as legible as his right-hand writing before injury. This he did by writing "backwards." This gave the idea of using "left hand" or "mirror writing" in cases with right-hand injury. Dr. Kerr took the matter up from a scientific standpoint and proceeded to put his idea into practice. But that was not all. With "mirror writing" as a starting point he proceeded to use it for a purpose. After letters came prefixes and affixes and in turn the derivation of words. Then came figures, then problems of a simple nature, later problems of a more complex nature, involving advanced mathematics. Being a mathematician he brought into play simple apparatus, made by the patients themselves, which in an easy way solved complex problems. So he keeps the men interested and mentally active. Thus he perfects the left-hand writing and incidentally widens their scope of knowledge.

Recreation.—Inasmuch as treatment in a hospital of this description extends over a considerable period of time in nearly all cases, it is necessary to provide recreation and diversion of some

[2]Mr. John G. Kerr, LL.D., is a Scotch educationalist of note, and his name is well known by educationalists throughout the British Isles. He gave up his post in Glasgow to take up his present work.

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kind for the patients. A large recreation room containing piano, and player attachment if desired, games of different kinds and three billiard tables is provided. More than once, when passing near, I have noticed men with crippled hands trying difficult shots, and, whether they made the shot or not, they were, unbeknown to themselves, treating their own disabled hands to good advantage. Football and hockey teams have been formed by the men. The later team matches itself against a team organized by the masseurs. Close to the hospital there is a small lake which provides rowing and fishing for the patients. Great care has been taken to select a good library, and from this books are given out to the patients in the usual way. Certain patients are intrusted with the loaning of the books. Discontent among the patients is seldom seen, and then, usually from some chap who has more than his share of the Hun's medicine and thinks he is being made too fit.

Treatment in hospitals of this type is of a gentle and painless nature, and the hospital records taken from occasional examination show a steady and gradual improvement. Cases treated are largely those which have already received the maximum treatment of the ordinary hospital. Many of these are discharged to go back into service and the others so far recover that they take up a civil, and in many instances a better, position than held before the war.

THE NATIONAL BOARD OF MEDICAL EXAMINERS

The Board has received authority from the War Department to erect at Camp Greenleaf, Chickamauga Park, Ga., a laboratory building for its use during the frequent examinations, which will be held in the Medical Officers' Training Camp, of those who wish to become licentiates of the Board.

Besides the laboratory, the building will be fitted up with a library and board rooms, and in the intervals between the examinations, we are informed, will be thrown open to the student medical officers of the camp for use as a reading and social club.

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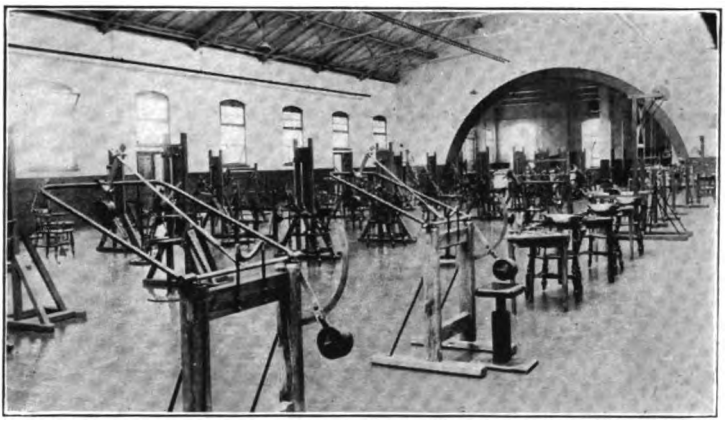
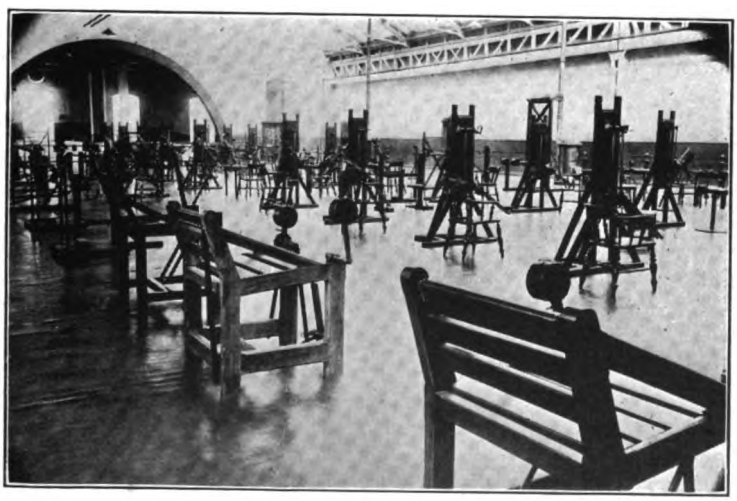


THE MECHANO.



THE MECHANO.

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THE POOLS; COLD AND HOT WATER.

THE HYDRO.

1. Whirlpool leg bath.

2. Multiple arm bath.

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THE GYMNASIUM.

PLASTER CASTS OF DEFORMITIES.

The two upper casts were modelled from radiographs through the radiostereometer.

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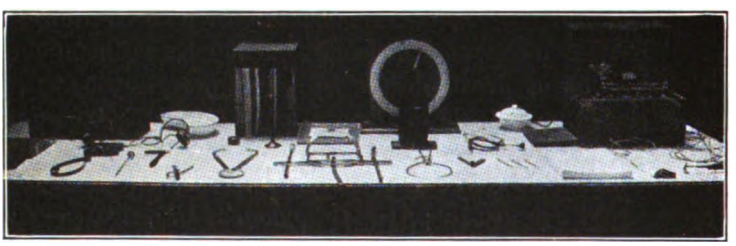
LEFT AND RIGHT HANDS OF A GOOD WOOD TURNER.



APPLIANCES FOR MEASURING DEFECTS.

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EDITORIAL

"OUR RESOURCES IN MEDICAL PERSONNEL"

THE MILITARY SURGEON in April, 1917, published an editorial under the above caption which, in the light of present experience, it might be well to review. Basing our estimates upon existing statistics, we assume there are 115,500 physicians in the United States actually available for all purposes, of whom, in round numbers, 80,000 are under 50 years of age. Of those over that age, 24,000 are between it and 60, giving a total of 104,000 possibly available for military duty.

Knowing as we do that from the firing line through the various sanitary formations, home and there, the services of physicians will be required for the best care of the sick of the army in the ratio of 1 to every 100 of the military personnel, it will be seen that for each million 10,000 physicians are needed. Congress has assumed that the army will supply seven-tenths of this number, the *elite,* as the Swiss call them, and the remaining three-tenths will come from civil practitioners presumably of advanced years or defective physique, through the Red Cross, or other civil organizations.

As our active medical officers would and should come, for the most part, from physicians below 50 years of age, we have 80,000 as a source of supply and resupply. Assuming that we shall need 7,000 of these for immediate service with each million of military population and that this population will approximate 5,000,000 (a total of 35,000 medical officers), we shall have left from our source of supply approximately 45,000 physicians. Fifteen thousand of these would be required for partial military service (Red Cross), and the remaining 30,000 could continue their civil duties. In addition to these latter there are the 25,000 between 50 and 60 years of age, making available for full civil practice 55,000 physicians, or one to about 1,800 of population. These 55,000 would be reinforced by the 15,000 on part time military duty.

We have not considered those over 60, for though many physicians over that age are in active and efficient practice, yet, in the aggregate, they would be offset by those below 50, inactive and inefficient. Neither have we considered the replacement of annual waste in the whole profession, which will be large, but which we assume will be made up through the medical schools.

Great Britain in peace times had one physician to 1,400 of population, barely enough. The war brought half of them into the army and navy, thus leaving one physician to every 2,800 civilians, while taking one as medical officer for each 250 of military population,

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just half what it should be. The conditions there are serious and equally so in France, both of which countries our physicians are endeavoring to help out.

With us the situation is not yet threatening, but demands consideration and the formulation of plans to meet any possible emergency. Of course this is no new story, several instrumentalities are considering the matter, and some have taken certain steps towards organizing the civil profession to meet a contingency the possible scope of which they have hazy ideas.

If we but stop to realize it, ours is now a nation in arms. Every activity of this country is directed towards one single object, the winning of the war; nothing else counts now, and nothing will count ever if we don't win it. No organization of any kind should be contenanced that has not this object in immediate view and likely to help in the most efficient way.

How, then, can our medical resources be conserved and utilized most efficiently to the best interests of all? For a nation grappling in a death struggle, THE MILITARY SURGEON can see one good answer —commission every reputable citizen physician below the age of 60 years in the Medical Reserve and, when requisite, call him to duty, not necessarily military, whenever or wherever it may be among civilians or soldiers. Easy to write, but it takes two to make a bargain and commissions have been declined.

We are probably not suffering this moment from lack of medical officers, as there are 25,000 of us, but, should volunteers fail, we soon would be in sore need of them to supply our rapidly increasing forces. Our civil population is not now generally lacking good professional advice, though the people may have to travel farther to get it and the physician to get to his patient. How long this satisfactory situation will obtain is an open question, but no intelligent person could question that while it does obtain is the time to prepare for its maintenance. How prepare?

A nation in arms instinctively looks to military organization in all its activities, and what more natural now than that we should wish to organize the entire medical profession of the country into a grand military reserve, commissioning every fit physician a reserve officer of the army or navy? This is really the status of all European medical men, but not so with us or Great Britain.

England has sought the solution of this problem for several years, though the unsolvable factor in her equation is the necessity to make one man occupy several places and do several men's work at the same time, because of woeful lack of physicians. This need hardly cut a figure with us; we will probably have enough to do the

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work if all are willing to lend a hand in a well-organized team.

Something has been said of moral coercion, "yellow" lists and such like, which of course the authorities would not for a moment countenance; indeed, General Gorgas has said it is not his policy to force anyone into the Medical Reserve. He may come voluntarily now; all are invited to accept commissions, which are freely offered to every fit physician on proof of fitness. To be sure, some of those within the draft age must serve, and may serve in a more humble capacity, and the "draft age" is not a fixed quality; but today the Medical Reserve is a volunteer body.

The Surgeon General of the Army, with clear vision, sees close at hand the time when we must have 35,000 medical officers with the *elite,* 15,000 reserve and 5,000 for re-supply. He writes: "I wish to call the attention of the profession at large to the urgent need of additional medical officers. Although the medical profession of the country has responded as has no other profession, further response must be greater and greater. The Department has almost reached the limit of medical officers available for assignment." His letter is most excellent, forceful and convincing. "I cannot emphasize too strongly the supreme demand for medical officers. It is not now a question of a few hundred medical men volunteering for service, but a question of a mobilization of the profession."

Gentlemen of the profession, the situation is before us. Can we not solve it ourselves? Will not the whole profession volunteer *en masse* and let the Surgeon General organize us as in his judgment is best for the people, the army and ourselves, the *elite* and its reserve up to 50 years, replacement to 60 years and emergency above that age. Assignment to duty within these classes would be determined by the exigencies, first of the forces, second of the civil population, and third of the individual medical officer. The profession trusts General Gorgas, the country believes in him and all the world respects him. Who better than he could organize us for the sole object of our present existence, to win the war?

It may be a figment of the imagination, this volunteer organization of the entire profession, or so much of it as is fit. It may be absurd to think that the majority of physicians would sacrifice their personal interests, give up the ease and comfort of home, the companionship of family and the society of friends—we have not mentioned the material things, which are more easily relinquished—all for love of country. But it is a wonderful ideal and maybe, if we don't do it, we will have no personal interests, no home, no family, no friends and no country. Is it not worth thinking about? Nor can we think about it too long; immediate action is necessary.

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INSTRUCTION OF OUR MEDICAL PERSONNEL

Lieut. Col. S. S. Creighton, M. C., upon his relief from the Training Camp Division of the Surgeon General's Office, after having inspected and instructed medical units in many camps and cantonments, wrote, among other things, the following:

A school for the training of officers should certainly be started early in each division. The thought of the average medical officer presenting military practice or conducting an outdoor exercise is so limited that it would be ludicrous were it not so serious.

It might be thought, by one not familiar with all the facts, that the medical officers' training camps should have prevented or corrected the state of affairs described by Colonel Creighton. Investigation reveals the facts, however, to be as follows: Of all officers commissioned in the Medical Department from the time war was declared until June 1, 1918, less than 40 per cent had been to medical officers' training camps. Of all medical officers so commissioned—that is, officers in the Medical Department exclusive of dentists, veterinarians and officers of the Sanitary Corps—about 47 per cent had been to Medical Officers Training Camps; and of enlisted men taken into the Medical Department in the same period, about 26 per cent had been to camps. It is also to be borne in mind that, of the officers and men who did go to training camps (medical officers' training camps), very few were able to complete the course of instruction, most of them having been ordered out after being in camp from two to eight weeks. From the above it is very apparent that it is incumbent upon every officer and enlisted man in the Medical Department to devote himself to the study, drill and practice necessary to make him a military man. Camp surgeons and commanding officers of hospitals have been ordered to establish and to push with energy schools of instruction for the personnel of the Medical Department, but these schools will avail little unless the personnel to be taught realizes the importance of the instruction which it needs and devotes itself to the acquirement of. P. M. ASHBURN.

EXPERIENTIA OMNIA DOCET

After all, it cannot be said that we Americans decline to be taught by our own experiences in war, though sometimes it might seem the teaching is accepted with considerable reservation.

The Spanish War, great in its results but insignificant in its military features, brought home to us of the Medical Corps a number of things, which were formulated under general conclusions and

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recommendations of the committee appointed to investigate the conduct of that war. These were:

1. That at the outbreak of the war the Medical Department was, in men and material, altogether unprepared to meet the necessities of the army called out.

2. That as a result of the action, through a generation of contracted and contracting methods of administration, it was impossible for the department to operate largely, freely and without undue regard to cost.

3. That in the absence of a special corps of inspectors and the apparent infrequency of inspections by chief surgeons and of official reports of the state of things in camps and hospitals, there was no such investigation of the sanitary condition of the Army as is the first duty imposed upon the department by the regulations.

4. That the nursing force during the months of May, June and July were neither ample nor efficient, reasons for which may be found in the lack of a proper volunteer hospital corps, due to the failure of Congress to authorize its establishment and to the non-recognition, in the beginning, of the value of women nurses or the extent to which their services could be secured.

5. That the demand made upon the resources of the department in the care of the sick and wounded was very much greater than had been anticipated, and consequently, in like proportion, these demands were imperfectly met.

6. That powerless as the department was to have supplies transferred from point to point, except through the intermediation of the Quartermaster's Department, it was seriously crippled in its efforts to fulfil the regulation duty of "furnishing all medical and hospital supplies."

7. That the shortcomings in administration and operation may justly be attributed, in large measure, to the hurry and confusion incident to the assembling of an army of untrained officers and men, ten times larger than before, for which no preparations in advance had been or could be made because of existing rules and regulations.

8. That notwithstanding all the manifest errors, of omission rather than of commission, a vast deal of good work was done by medical officers, high and low, regular and volunteer, and there were unusually few deaths among the wounded and the sick.

Thus having summarized its conclusions, the committee submitted the following recommendations:

1. A large force of commissioned medical officers.

2. Authority to establish in time of war a proper volunteer hospital corps.

3. A reserve corps of selected trained women nurses, ready to serve when necessity shall arise, but under ordinary circumstances owing no duty to the War Department except to report residence at determined intervals.

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4. A year's supply for an army of at least four times the actual strength, of all medicines, hospital furniture and stores as are not materially damaged by keeping, to be held constantly on hand in the medical supply depots.

5. The charge of transportation to such extent as will secure prompt shipment and ready delivery of all medical supplies.

6. The simplification of administrative "paper work," so that medical officers may be able to more thoroughly discharge their sanitary and strictly medical duties.

7. The securing of such legislation as will authorize all surgeons in medical charge of troops, hospital transports, trains and independent commands to draw from the Subsistence Department funds for the purchase of such articles of diet as may be necessary to the proper treatment of soldiers too sick to use the army ration. This to take the place of all commutation of rations of the sick now authorized. Convalescent soldiers, traveling on furlough, should be furnished transportation, sleeping berths and $1.50 per diem for subsistence, in lieu of rations.

These findings have served as a text which the Medical Department has loyally endeavored to live up to, so far as in its power lay.

We still lack the special corps of inspectors upon which the report lays so much stress; but, as a substitute, General Gorgas has organized within his office a department of inspection made up of some of the most efficient and experienced medical officers. The work they are doing is invaluable, but experience teaches that this improvised organization should be given legal status with the special authority found necessary during the Civil War.

Then, too, we are still without authority over the transportation of supplies pertaining to the Medical Department, a condition which was one of the most serious handicaps to us in the Spanish War, and oftentimes made it impossible to fulfil the requirements to furnish all medical supplies. The solution of this question is hopelessly out of our hands, and the Surgeon General is debarred from organizing a workable substitute. It may be that out of the present extraordinary conglomeration of the Quartermaster's Department good may come through the experience of this war and the Army will have an independent Transport Corps, a military organization, owing equal allegiance to all arms, corps and departments, as is the case in well-organized armies. In such an event, the Medical Department will have assigned to it and under its direction a proportionate share of transport.

These are a few things, of all the committee recommended, we have not yet been able to accomplish.

What the Medical Department has done since 1898 makes a creditable record of progress in all possible directions, as evidenced

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by the fact that, though comparatively small, it came into General Gorgas' hands an efficient instrument with which, and his genius for organization, he has built up a wonderful organization, always growing to meet every emergency.

Beginning with six hundred regular medical officers, a few dental officers, three thousand enlisted personnel and three hundred women nurses, he has expanded his department until it now numbers 34,000 thousand officers, of five corps constituting the Medical Department, nearly two hundred thousand sanitary soldiers, ten thousand trained nurses, female, with the numberless auxiliary organizations which look to him for direction—many more individuals than were in the entire regular army when the war began.

At the outbreak of the war we had but four permanent general hospitals, with a maximum of a thousand beds. General Gorgas has organized within the year 83 hospitals of all kinds, with 75,749 beds. Nor is this all, for the entire organization at the front and in our various dependencies, all come under his administrative supervision and are exclusive of those above enumerated.

These hospital beds are, of course, provided with a view to their occupancy, and fifty thousand are probably occupied today by soldiers for whom the Surgeon General is wholly responsible. No other person, short of the Secretary of War, has any control whatever over any soldier in a general hospital. As time progresses, more and more of these beds will be occupied, and it is quite reasonable to estimate that General Gorgas will soon be responsible commander of at least three hundred thousand soldiers, well and ill.

To meet this responsibility, which would overwhelm an ordinary man, even he must have loyal assistance from all, within and without the service. Every military department should help and, certainly, in no way hamper his efforts; he knows his business far better than they do, he has proved his capacity for accomplishment, and what he has done since this war began is evidence that the genius which made the Panama Canal possible has not abated any of its force—indeed, has strengthened against the far greater demands which are now being made upon it.

The profession believes in and trusts General Gorgas and his corps are his loyal and enthusiastic followers. Moreover, and above all, the country has given its sons into his keeping in every confidence that its trust will not be betrayed, and with firm resolve that this brave, able, modest soldier-physician shall in no way be unnecessarily hampered in his work for them, but heartily supported by all until this war is won. Experience has indicated the man and experience has pointed out the way.

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"CARRY ON"

THE MILITARY SURGEON welcomes a new star in the journalistic firmament, ΕΠΙΤΟΝΩ, whose brilliancy is such that it promises soon to be of the first order. "Carry On," the initial issue of which has just reached the editorial desk, is the mouthpiece of the Office of the Surgeon General of the Army in its herculean task of, in General Gorgas' words, "the medical and training treatment of the disabled soldier, until he is cured or as nearly cured as his disabilities permit." The underlying idea being to return our soldier invalids to civil life in physical condition to pursue a career of usefulness in some direction, no matter how great their mutilation.

Perhaps no single humanitarian movement in all this welter of war, nothing so Christlike, equals this undertaking to bring real happiness and usefulness to "the maimed, the halt and the blind," to those who otherwise would be but the waste of war, useless to themselves, a burden to the community and a handicap to the world's progress.

Our soldiers—God bless them and give them victory!—will welcome the opportunity of rehabilitation, if they in the beginning receive the encouragement so necessary to the weak, maimed, disfigured, and discouraged man, who looks upon his career as ended.

So the function of *Carry On* is not alone to reëducate the disabled soldier, but to convince his public of the necessity for such reëducation for the man, as well as the community—the latter quite as important and difficult a task as the former.

It is possible our people have not realized the attitude of no small portion of the citizenry towards those to whom they think "the Government owes a living" and who would persist in working, "taking the bread out of their fellow's mouth," as the proletariat are too prone to say.

Nor is this a figment of the imagination. Probably many of the older medical officers of the army have observed and commented upon it. One case, of several, comes to mind. In our last Indian engagement a trooper was quite severely wounded. His conduct in the fight was gallant and won for him the encomiums of his officers and comrades. Returning to the permanent station of his command, he gradually recovered and slowly resumed his duties. Encouraged by the medical officer and assured of the sympathy and support of his own officers, he persisted for some time with his rehabilitation. Finally he gave up and petitioned for his discharge on surgeon's certificate. Disappointed at the outcome, the medical officer asked

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the man why he threw away such an opportunity for advancement in an organization where he had the regard of all. He replied, "Sir, I know the officers would help me to advance, and I think I shall soon get my strength back; but I can't stand this life. I never go into the barracks but some man says to me, 'You're a damned fool to work; the Government owes you a living. Why do you fool around here any longer?'" The persistence of this attack finally overcame the man and he was given his D. S. C.

We are informed that other countries are having like experiences, and Great Britain has found it necessary to assure her invalid soldiers that rehabilitation would in no wise interfere with their pension allowance.

So, God speed you, *Carry On,* in your great mission; and may you be as successful in teaching the people, as we know you will the soldier-men, the beneficence of the work you have undertaken.

RETIREMENT OF COLONEL JOHN VAN R. HOFF, M. C., U. S. A.

It is with regret that THE MILITARY SURGEON announces the retirement of Colonel John Van R. Hoff as Associate Editor. The facts are set forth in the subjoined communication. In his reply to an inquiry from the Chief of Staff as to the editorial on "The Passing of the General Staff" (THE MILITARY SURGEON, July 1, 1918, pages 74 to 76), Colonel Hoff assumed the entire responsibility for the appearance of said editorial, thus relieving The Association and its literary organ of any responsibility for the same.

The following is the action of the Executive Council in this matter:

The Executive Council of The Association of Military Surgeons learns indirectly through an official correspondence between one of its members and the War Department that an editorial published in the July number of the journal entitled "The Passing of the General Staff" has been defined as false in fact and misleading in intention.

In view of the source from which this definition comes, the nature of the national activities at this time and the high aims and purposes for which The Association of Military Surgeons professes to stand, the Executive Council, duly acting for the Association, herewith expresses its regrets that such editorial was published. The Council further expresses the belief that the editorial in question is not an expression of the opinion of The Association.

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ASSOCIATION NOTES

THE TWENTY-SIXTH ANNUAL MEETING

Plans are crystallizing looking to the largest gathering of members and the greatest meeting of The Association in its history, at Camp Greenleaf.

Col. E. L. Munson, M. C., U. S. A., commanding the camp and secretary of The Association, writes:

I will take up the matter of the program. . . This camp is just receiving practically all the personnel from Fort Riley, and nearly all the medical officers who come into the army hereafter will pass through the place; so we can, of course, assure a very large attendance.

The weather at the time (October 14, 15 and 16) ought to be good, and probably a large part of the program will take the form of practical demonstration of all phases of the work we are doing here. The latter is very extensive, with numbers of subsidiary schools, and the professional element is being largely featured up in our schools for specialists. It has moved beyond the mere training camp idea and has almost a university significance through its professional courses.

Chattanooga, a city of a hundred thousand population, is 10 miles from the camp by concrete (government) road, and there is communication by trolley. The Hotel Patten, an up-to-date hostelry, is located in the city, and there is also an excellent hotel about forty minutes by trolley from Chattanooga, known as Signal Mountain Inn, where the surroundings are very attractive.

There are eleven great military camps within a night's run of Chickamauga, and several large separate hospitals, altogether with quite twenty-five hundred medical officers, of whom it is hoped that several hundred will attend the meeting. We can accommodate those who would prefer a taste of soldier life in barracks and arrange for their entertainment. We have large auditoriums which will seat almost any number, and, if the weather is good, we have outdoor domes most attractive and suitable for purposes of meeting.

No doubt the great feature of the meeting will be the bringing out of the progress made by the medical departments during the first year of war. This would be along the lines of similar symposia which have become a feature of the medical service in both British and French armies. These have stated meetings, at which representatives of all the camps attend for the purpose of disseminating information about new methods and ways of overcoming difficulties.

It seems to me that this affords an opportunity not only to have a particularly interesting meeting, but to make it of very great practical importance to the medical services of the Government as well. The Navy and Public Health Services would have equal interest in the work, and should contribute their full quota of valuable experience.

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A meeting of the Executive Council was held at the call of the president at Washington, August 1 and 3, 1918.

Col. John Van R. Hoff, U. S. A., Retired, submitted his resignation as Acting Secretary-Editor and Treasurer *ad interim,* and Col. Louis A. La Garde, U. S. A., Retired, was elected to act in these offices.

The 443 medical officers named below, having complied with the requirements of admission, were duly elected to membership in The Association of Military Surgeons, U. S.:

Medical Corps, U. S. Navy

Assistant Surgeons

Lockhart D. Arbuckle
David F. Bentley, Jr.
Carl Ashton Broaddus
Harry L. Brockmann
Marion Earle Brown
Paul M. Drake
Linton Gerdine
William T. Gill, Jr.
James Edwin Houghton
Harold Lund Jensen
Lewis W. Johnson
E. W. Larkin
Wilbur O. Manning
George L. McClintock
Robert B. Miller
Math. J. Montgomery
William P. Mull
Robert L. Nattkemper
James Earl Potter
Philip F. Prioleau
Aaron Robinson
William W. Russell
Herbert L. Shinn
John L. Shipley
Willis E. Sullivan
George W. Taylor
Eugene W. Torrey
Walter A. Vogelsang
Robert E. Watkins
Joel J. White

Medical Corps, U. S. N. R. F.

Surgeon

Halsey De Wolf

P. A. Surgeons

Thomas B. Holloway
Llewellyn C. Merrill
Ivan A. Parry
Francis Whittle Upshur

Assistant Surgeons

Robert F. Buehl
S. B. Burk

Assistant Surgeons-Con't.

Francis W. Carll
Sidney B. Conger
Lloyd F. Craver
Clifton L. Dance
William R. Delzell
Hartley G. Dewey
Walter E. Divine
Olen E. Eicher
Thomas C. Eley
Almedes F. Feraco
James F. Finnegan
Claude A. Frink
Frank M. Gaetineau
Robert M. Goldberg
Joseph B. Goodall
Franklin M. Goodchild
Fred R. Haselton
T. Charles Hemmingsen
Herbert G. Hughes
John J. Loughlin
John Kent Leasure
William Moore
Harry E. Murphy
George M. Murray
L. B. Norris
Alfred L. Potter
Herman C. Petterson
Gustav R. Petz
Max Rosenzweig
Henry S. Rubin
Jacob Skeer
Marcus E. Stites
Claude V. Timberlake
John M. Whitehead

Medical Corps, N. N. V.

P. A. Surgeon

Thomas C. Pounds

Assistant Surgeon

Clifford H. Fulton

Medical Corps, National Guards, U. S.

Captain

Albert Aisenstadt

First Licutenants

Leon Block
Gaspare E. Lentine

United States Public Health Service

Acting Asst. Surgeon

Henry Wellman Emile Walther

Medical Corps, U. S. Army

Majors

Henry B. McIntyre
James L. Robinson

Captain

Charles H. Jameson

First Lieutenants

Charles C. Dickinson
Oliver S. Gilliland
Charles R. Glenn
Read B. Harding
Robert J. Platt

Medical Reserve Corps, U. S. Army

Majors

William J. Bell
David H. Bergey
Thomas J. Harris
Frank E. Leslie
Thomas P. Lloyd
William H. Oates
J. Morris Slemons
William G. Somerville
Thew Wright

Captains

Arthur W. Akerley
Luke P. Allison
William W. Anderson
James A. Anderson
Frank E. Andre
Carlton H. Andrew
Zadok F. Atwell
George T. Ayres
Raymond De W. Baker

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Captains—Con't.

P. D. Banhill
William Barnhart
Walter A. Bayley
Samuel L. Beard
J. L. Bendell
Louis J. Bennett
Gideon Benson
Judson H. Cole
E. H. Best
James R. Bibighaus
Vernon L. Bishop
Byron B. Blatz
Jesse S. Bragg
Harry E. Breese
Robert H. Buck
Matthew G. Buckner
Charles B. Burke
Edward W. Burke
French S. Cary
Samuel A. Clark
Newton Craig
William L. Crosthwait
Samuel C. Crow
Robert A. Cushman
Edward F. Davis
Daniel W. Davis
Frank M. Denslow
Herman R. Dewey
Clyde O. Donaldson
Dred R. Dorente
Harry B. Dornblaser
Wilfred G. Dronin
Henry K. Dunham
Hermann Elwyn
Thomas Evans, Jr.
Edward H. Eyerman
Edward L. Flanagan
William S. Foster
Albert G. Franklin
William J. Gates
John Ulrich Giesy
Carbon Gillaspie
Patrick L. Gordon
Alfred W. Gray
John R. Green
George A. Grieumard
Chauncey W. Grove
Noel E. Guillet
Milton Hahn
Walter W. Harris
Raymond V. Harris
William E. Hart
Robert E. Hearne
Harry M. Hedge
Henry Heileman
Peter W. Hess
Clyde T. Hockett
Charles W. Hoffman
Isaac MacMunn Holly
A. Philo Howard
John F. Hull

Captains—Con't.

John Hynds
Dempsey C. Iles
Robert M. James
Charles S. James
James Jeter
Frederick A. Johnson
Wilson Johnston
Claude P. Jones
Erwin W. Kleinman
Arthur C. Klentgen
Leroy P. Kuhn
J. Allen Kyle
Jacob Lanski
Emil Z. Levitin
Hampden S. Lewis
Jesse H. Libby
Arthur D. Little
Samuel A. Loewenberg
Henry B. Malone
Charles P. Martin
James B. Mason
George H. Maxfield
Charles G. McEachern
William J. McGrath
John H. McSwain
Homer A. Millard
Dana E. Monroe
Harry M. O'Reilly
Oscar M. Owensby
Harry S. Oyler
Elmer B. Packer
William L. Palmer
Willard S. Parker
Thomas M. Paul
Edwin L. Perkins
John H. Pettis
Hiram E. Pintler
Joseph E. Pollard
Herbert C. Powers
Harry L. Purdy
Francis L. Quigley
Bernard Rabinovitz
Thomas Ragan
William G. Ramsey
George M. Randall
Linley M. Reagan
Horace Reed
Owen C. Rees
Homer Reese
Edward P. Richardson
Harry L. Richardson
Otto L. Ricker
Herbert A. Robinson
Sol Rosenblatt
Louis Rossieur
Charles P. Schenck
William E. Shackleton
Clarence L. Six
Rodney D. Smith
A. Donaldson Smith
Myron W. Smith

Captains—Con't.

George F. St. John
Madison U. Stoneman
Eugene P. Sullivan
Joseph C. Surage
J. Boyd Swonger
Charles W. Taylor
Wilbur F. Thomson
Theodore I. Townsend
David Townsend
Anatole Raoul Trahan
William G. Turner
Herman A. Tyler
Ferdinand C. Walsh
George H. Wetzel
Duncan S. Werth
John A. White
Allan S. White
Hugh J. White
William H. L. White
Nelson M. Whitehill
Harold M. Whiteway
Horace L. W. Wignall
John W. Hooper
Harry H. Wyman, Jr.
J. Rudolph Yung
Sidney C. Zemp

First Lieutenants

Edward R. Askew
Richard V. Austin
Julian T. Bailey
William J. Bailey
George C. Barone
George S. Bawden
Frank B. Berry
Squire S. Beverly
Henry H. Beinfield
Henry E. Binet
John T. Boykin
Alexander Borland
Charles W. Bressler
Harry E. Brooks
Elber R. Brubaker
George F. Bullard
Howard M. Bush
Thomas J. Cagle
Phares W. Callihan
William B. Catto
William S. Coleman
Guy C. Conkle
Gladstone C. Conlin
Compton N. Crook
George E. Cross
William H. Daniels
Charles R. Deeds
Enoch M. Dibble
Louis DeH. Donaldson
Wallace H. Drake
William C. Doncaster
Lorenzo S. Drury

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First Lieutenants–Con't.

Carl T. Eber
Peter E. Fagan
Harold Feil
Giovanni Fasano
Lee T. Ferrell
Jacob N. Feinberg
Carter S. Fleming
G. Fredrickson
M. L. Fuller
George E. Gallaway
Gilbert H. Galford
Joseph F. Gallagher
Arthur H. Gaston
Paul C. Gauchat
Fred C. Goddard
Francis A. Goeltz
Joshua M. Gordon
Harry L. Goss
Eugene F. Griffiths
James T. Gregory
Vierl C. Griffs
Louis W. Grossman
Daniel L. Hollis
Walter F. Hamilton
John W. Harper
Fred Hamilton
Henry C. Harris
Harry J. Handelman
William S. Hartford
Victor H. Hasek
Edgar V. Henry
Gustav M. Helland
Thomas W. Hedrick
Martin L. Helfrich
Sherman S. Hesselgrave
Walter B. Hillman
Solomon Hirsch
Bud H. Higdon
Bush Houston
Joel R. Holliday
Paul G. L. Hock
Mark C. Houston
Moses C. Hughey
James E. Hubbard
Wellington B. Huntley
Sidney Israel
James J. Jennie
Barton W. Johnson
William H. Johnston
Morris Joseph
Gerhard Kaemmerling
Boldridge E. Kneece
William E. Kriess
Henry A. Latane

First Lieutenants–Con't.

Elah A. Lapham
Sidney P. Levey
Claude A. Lingenfelter
John D. Leonard
Jesse DeL. Lewellen
George D. Lockie
Louis A. Loewenberg
Edward K. Lubin
David M. P. Magee
Harry S. Marcley
Abraham L. Margolies
John W. McCollom
Arthur A. McClurkin
Carl L. McCallum
Claudius McGowan
Guy L. McKinney
Thomas D. McRossie
Joseph C. Menendez
Dudley J. Morton
Grady A. Morgan
Fred N. Morford
Joe M. Neal
O. Andy Nelson
Ole S. Neseth
Alvah P. Norman
Joseph F. O'Brien
John O'Connell
Joseph F. O'Donnell
John H. Opetz
Leon E. Pangburn
Henri A. Paradis
Lucius K. Patterson
John H. Payne
Frank W. Plehn
Joseph S. Podesta
James H. Poulton
James C. Preston
James M. Quick
John T. Ramsey
Donald T. Rankin
Eldred L. Rawles
Dalton H. Ray
Albert Z. Redelin
Homer L. Redd
William H. Riley
Polk Richards
Arthur C. Richards
Linwood L. Righter
Henry B. Richardson
Herbert A. Rodenbaugh
Francis T. Rollins
E. Theo. Robinson
Edwin P. Ruggles

First Lieutenants–Con't.

Ralph T. Saunders
Thomas C. Savage
Hugh J. Savage
John P. Scales
Harold Schwartz
Frederick W. Schultz
Hugo C. H. Schroeder
Joseph D. Seiberling
John L. Sengstack
John D. Simons
Robert H. Shepherd
Omar R. Sevin
William M. Sheridan
William C. Sheehan
George B. Sickel
Otto W. Simpson
Charles R. Sista
Fred M. Smith
Arthur J. Smith
A. Burton Smith
Buell H. Sprague
Louis C. Sondel
Frederick Swing
Salvatore C. Sunseri
Roy G. Stevens
John G. Thomas
Bela D. Thomas
Paul R. Tindall
August O. Truelove
Henry Trautmann
Winn Traylor
John L. Trice
Andrew J. Turner
George T. Twyman
Ross H. Underwood
Orin T. Upahaw
Claude M. Vaughan
John C. Vinson
Reynold C. Voss
Nicholas Wolman
Joseph J. Waff
Paul B. Wallace
Albert J. Weirick
Edwin M. Wells
Clarence M. Westerman
William C. Wright
Clair Wilson
William H. Witherstine
Clyde O. Williams
Embry P. Wilson
Alfred Woodhouse
John H. Woolridge
Lowell L. Youngquist

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COMMENT AND CRITICISM

BEWARE OF THE DANGEROUS HOUSE FLY AND EXTERMINATE THE MOSQUITO[1]

We are now in the midst of the season when to "swat" one fly is to prevent the propagation of millions of its descendants during the summer and autumn, with all the attendant dangers.

We quote freely from a leaflet recently published by the Merchants Association of New York, which has quite as much application to military as to civil life:

The fly has no equal as a germ "carrier"; as many as five hundred million germs have been found in and on the body of a single fly.

It is definitely known that the fly is the "carrier" of the germs of typhoid fever; it is widely believed that it is also the "carrier" of other diseases, including possibly infantile paralysis.

The very presence of a fly is a signal and notification that a housekeeper is uncleanly and inefficient.

Do not wait until the insects begin to pester; anticipate the annoyance.

April, May and June are the best months to conduct an anti-fly campaign.

The farming and suburban districts provide ideal breeding places, and the new-born flies do not remain at their birthplace but migrate, using railroads and other means of transportation, to towns and cities.

Your friends and members of the family now in the service should be reminded of the danger of the house fly in camps and coöperate with their superiors for the elimination of this deadly pest.

Kill flies and save lives!

RECIPES FOR KILLING FLIES

The United States Government makes the following suggestion for the destruction of house flies: Formaldehyde and sodium salicylate are the two best fly poisons. Both are superior to arsenic. They have their advantages for household use; they are not a poison to children; they are convenient to handle, their dilutions are simple and they attract the flies.

Preparation of Solutions

A formaldehyde solution of approximately the correct strength may be made by adding 3 teaspoonfuls of the concentrated formaldehyde solution, commercially known as formalin, to a pint of water. Similarly, the proper concentration of sodium salicylate may be obtained

[1] With three illustrations.

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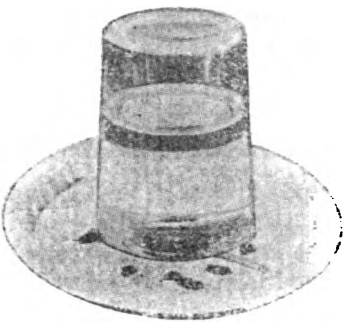
by dissolving 3 teaspoonfuls of the pure chemical (a powder) to a pint of water.



CONTAINERS FOR SOLUTIONS

A container such as shown above has been found convenient for automatically keeping the solution always available for flies to drink. An ordinary, thin-walled drinking glass is filled or partially filled with the solution. A saucer, or small plate, in which is placed a piece of *white* blotting paper cut the size of the dish, is put bottom up over the glass. The whole is then quickly inverted, a match placed under the edge of the glass, and the container is ready for use. As the solution dries out of the saucer the liquid seal at the edge of the glass is broken and more liquid flows into the lower receptacle. Thus the paper is always kept moist.

Other Simple Preventives

Any odor pleasing to man is offensive to the fly and *vice versa,* and will drive them away.

Take five cents' worth of oil of lavender, mix it with the same quantity of water, put it in a common glass atomizer and spray it around the rooms where flies are. In the dining room spray it lavishly even on the table linen. The odor is very disagreeable to flies but refreshing to most people.

Geranium, mignonette, heliotrope and white clover are offensive to flies. They especially dislike the odor of honeysuckle and hop blossoms.

According to a French scientist flies have intense hatred for the color blue. Rooms decorated in blue will help to keep out the flies.

Mix together one tablespoonful of cream, one of ground black pepper and one of brown sugar. This mixture is poisonous to flies. Put in a saucer, darken the room except one window and in that set the saucer.

To clear the house of flies, burn pyrethrum powder. This stupefies the flies, but they must be *swept up* and *burned.*

Recipes for Stables, Barns and Out-of-doors

Borax is especially valuable around farms and out of doors. One pound of borax to twelve bushels of manure will be found desirable as

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a poison without injuring its manurial qualities or farm stock. Scatter the borax over the manure and sprinkle with water.

Lye, chloride of lime, or copperas (sulphate of iron) dissolved in water, crude carbolic acid, or any kind of disinfectant may be used in vaults.

In this connection, Major Isaac W. Brewer, M. R. C., has submitted to the Surgeon General of the Army the following:

1. It is almost impossible to prevent flies from entering the mess hall unless there is a satisfactory vestibule provided for each door. A year's observation of the present type of mess hall makes me believe that there are too many doors in the building and that most of them could be disposed of with a saving of material and without in any way inconveniencing the organization. I would suggest, in addition to the doors opening into the kitchen, that two doors be provided for each mess hall and that these be located in the end farthest away from the kitchen. These doors should open into a vestibule which should be about 3½ or 4 feet wide, 7 feet high, and covered at the top. A rough sketch of the proposed vestibule is enclosed herewith. This construction should be of black beaver board or, if that is not possible, of building paper. It should be constructed parallel with the gable of the building and should then turn at right angles, extending about 8 feet parallel with the side of the building and opening into the building at right angles to the sides. The two doors leading from the vestibule into the mess hall should be provided with screens. The doors leading from the outside into the vestibule should be made of solid material, the object being to keep the vestibule as dark as possible.

2. I have frequently noticed that there is considerable smoke in the mess halls and in the kitchens due to cracks in the alimo cooker. This is caused by a weight being placed on the alimo at the time when it is red hot, causing it to bend, and the different parts do not then fit properly. It is almost impossible to prevent the cooks from putting G. I. cans on top of the alimo and I would therefore suggest that a stout piece of iron be placed across its top, on the under side, with a slot or ring so placed in it as to receive another rod of iron that will extend from the center of the alimo to the ground, thus forming a general support to the top.

3. One of the great difficulties in the use of the Havard boxes is that at times of great change in temperature there is a considerable consolidation of moisture on the lids of the seats. This has been obviated in one organization by the use of a stove-pipe ventilator which extends through the top of the latrine building, thus allowing the moisture to escape and preventing it from consolidating on the seats. This ventilator is covered by pieces of wire screening. I believe, if such a ventilator is put in each latrine, it would make them far more comfortable for the persons who have to use them. In some cases it is impossible to

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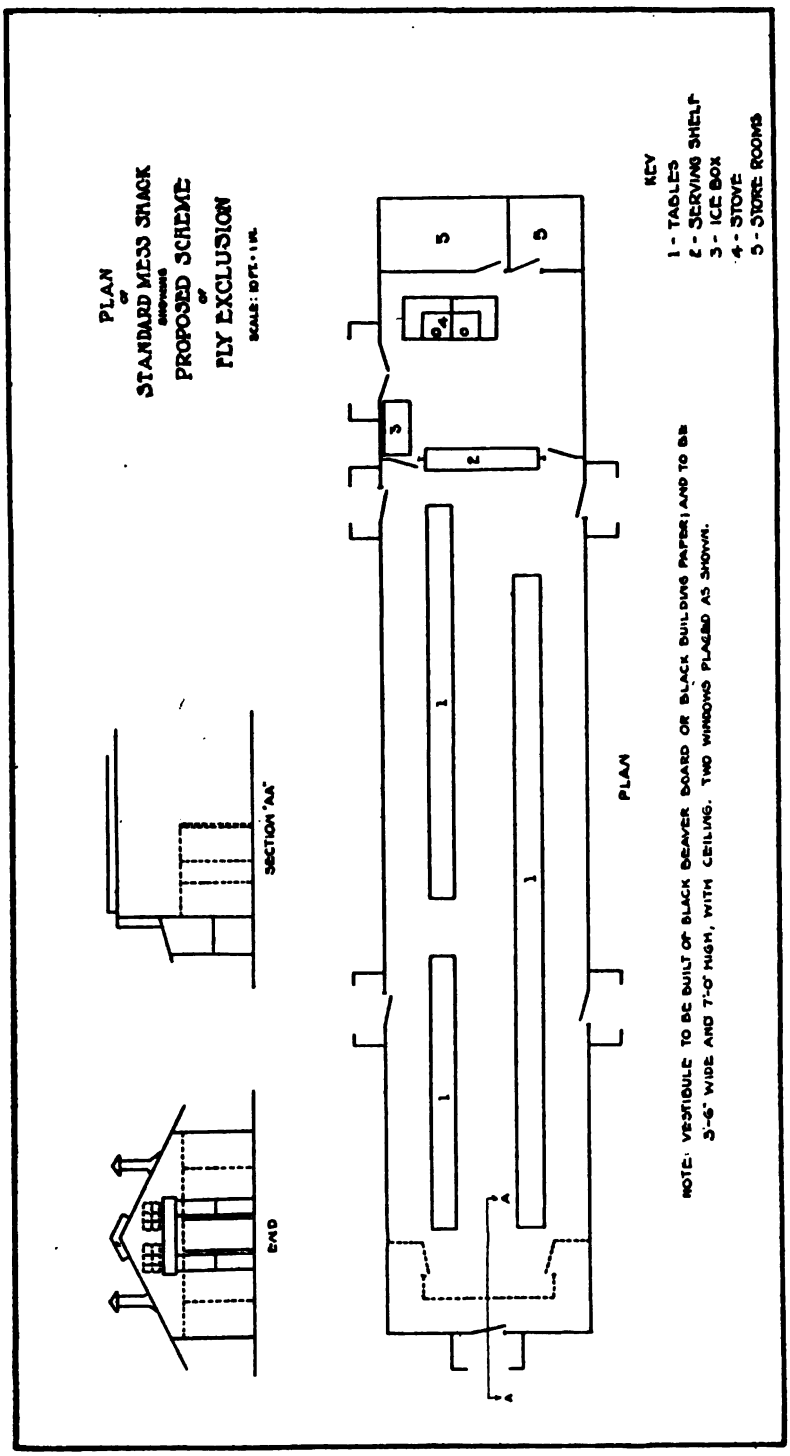

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keep a few flies from entering the Havard boxes. In the 4th Division we placed a fly trap on a board that just fitted into the hole of the latrine box and provided a large opening in the board so that any flies getting into the latrine and endeavoring to get out would be caught in the trap. I think it is a practical suggestion and will probably prevent a number of diseases through occasional flies entering the latrine.

Urinals.—The present urinal in use in all of the camps is very unsatisfactory. It has a large amount of piping connecting it with the latrine pit. At Fort Ethan Allen, Vermont, last summer, Maj. William A. Powell devised a very simple urinal which consisted of a small trough with a short pipe which was placed directly over a part of the Havard box, thus opening directly into the latrine. There was a minimum amount of pipe and there was no difficulty in passing a rod through it displacing any substance that might have clogged the pipe. The pipes were made of tin, similar to that used in making the urinals. This proved to be a very satisfactory urinal and was used in all the latrines at Fort Ethan Allen.

Speaking of household pests, THE MILITARY SURGEON is indebted to Lieut. P. H. Brigham, M. R. C., for the following devices, which he has found efficient in disposing of mosquitoes:

1. *An Automatic Oiling Device.*—Fort St. Phillip, La., situated in a low, flat country, where mosquitoes abound, has large areas of standing water both inside and outside of the sea wall inclosure, which it is quite a problem to keep oiled sufficiently and continuously. Remembering the fact that oil is lighter than water and, therefore, will seek the surface, I filled a bottle full of crude oil, cut two grooves in a cork, one on each side, placed the cork in the bottle, poured a little oil through one groove, submerged the bottle about 6 inches below the surface in a nearly upright position and fastened it to the bank with a string, so it could be recovered and refilled. The water percolating through the groove not occupied by the oil sinks to bottom of the bottle, displacing the oil through the oil groove in large drops which, rising to the surface, float for a short distance and burst into a beautiful film of oil, covering a large area.

By pressing the cork in more or less tightly, the speed of the oil bubble is regulated. When first placing the bottle in a new area to be oiled, I allow the bubbles to develop about five minutes apart; after a film has been formed completely over the area, one drop in fifteen minutes is sufficient. A quart of oil will last approximately three days. In one pond of considerable area I have a 5-gallon jug arranged in this manner, which should not need refilling for nearly sixty days. For approximately two hundred yards or more outside the sea wall, all around the post, I have twenty-four bottles in operation, which keep a continuous film of oil on the surface of the standing water. There

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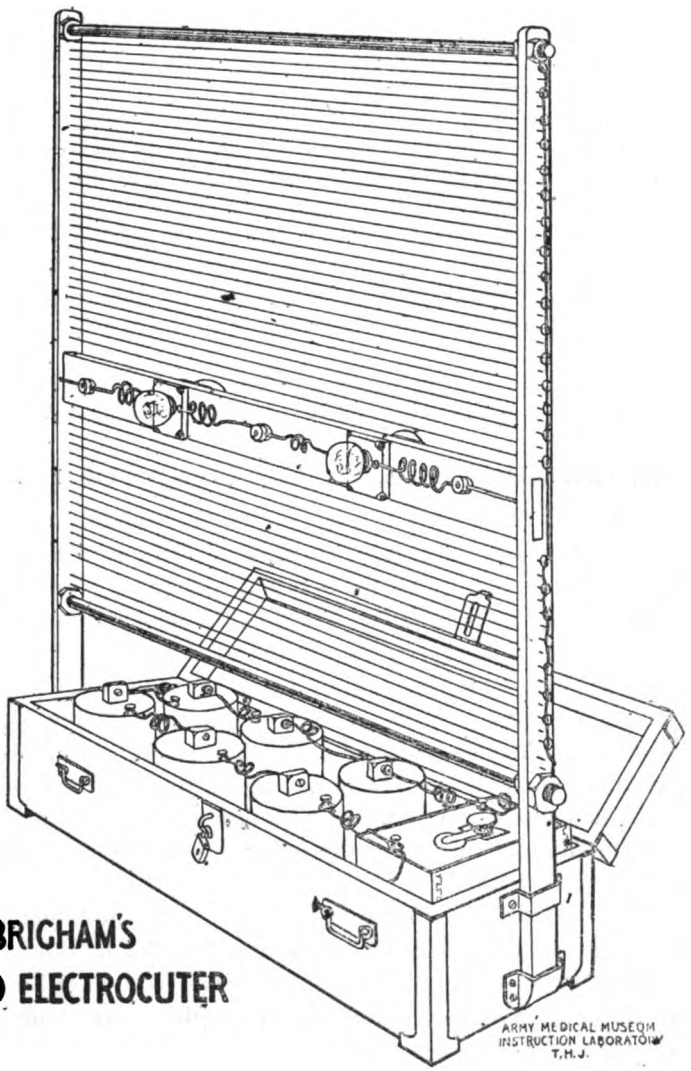
are eight bottles within the inclosure. All of these automatic bottles are working absolutely successfully and are visited once a day by a man trained to this work, who observes their action and refills bottles when nearly empty; this is all of the care necessary. I claim for this device economy of oil, less labor to maintain the desired result, and saving of time, as less than two hours is used in inspecting the bottles.

I arranged an automatic oiling bottle with a small parachute, which was shot over an inaccessible pond of water with a bow gun with rubber bands for power. The bottle would go a hundred feet in the



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air, and dropping spread the parachute which would allow it to strike the water gently and right side up, when it would submerge and start throwing bubbles of oil every five minutes. Thus I oiled ponds I could not otherwise have reached at Fort St. Phillip.

2. I have been experimenting for some time with a device for destroying mosquitoes by electricity. It consists of a wooden frame enclosing a screen of copper wire, wires being about an eighth of an inch apart and alternately connected with a positive and negative wire, so that when a mosquito or other insect strikes the screen or lights on it, it makes a connection between the positive and negative wire closing the circuit and is thus electrocuted. An electric lamp is fastened to the frame, the light from which attracts the mosquitoes and other insects to the locality.

With alternating current, 110 volts, it is a success; but the direct current of ordinary lighting voltage does not produce sufficient heat to electrocute insects, unless they alight for an appreciable length of time (two or three seconds), so a large number get away.

At Jackson Barracks we tried this device several times with alternating current, and it burned everything that struck it.

My present model is the same positive and negative wire screen, set perpendicular to a box that contains six dry cell batteries, and an induction coil.

This makes a compact machine which can be carried about and used anywhere. It makes a fat spark when the mosquito or fly touches it.

THE TRAINING OF THE ENLISTED MAN OF THE MEDICAL DEPARTMENT

In all human undertakings success or failure, in the last analysis, depends upon man. No matter how perfect the plan or machine, it will fail if the man fails. So, that the man may not fail, instruction, practice and experience are found to be the safeguards.

In an army all trades and professions combine to perfect the fighting man and place him on the battle line. After that the result rests with him. There is no appreciable difference in the object of training a soldier and training a prize-fighter. Nor does it take, in the aggregate, a much smaller number of individuals to do the work in the one case than the other, while the specialty of each is equally well defined.

The functions of the so-called staff corps, and hence the name, are to prepare everything necessary for the fighter. His actual training, as with the prize-fighter, is given by men of his own kind—his officers. The motives of the two fighters are vastly different; the end results are the same.

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The Medical Department cuts a large figure in the personal care of the soldier-man, that he may be fit to fight. It embraces many specialties to this end, and the training of its own enlisted sanitary troops for their many different special duties is of great importance. Maj. Guthrie McConnell, M. R. C., outlines one phase of that training, as follows:

If the question were asked today as to what is the most important advance that has been made in the care of mankind, there would be few dissenting voices if the answer were "preventive medicine." It is this advance that has enabled those in charge of the medical side of this world war to control what, in even quite recent times, would have been serious outbreaks of disease. If there be further inquiry as to what it is that has made preventive medicine possible, the answer this time is "the laboratory" and all that that term includes. Very few of the laity realize that the physician of today uses constantly, in his work, aids that at one time were referred to as "laboratory toys" by those opposed to their employment. Yet many of those laymen understand that there is more to medicine than opening an abdomen or giving a pill. They appreciate the fact that there must be men trained in special ways to perform those examinations that are being required, or to experiment with new methods, or to do both. It is no longer possible for one individual to do expertly both clinical and laboratory practice.

In order that the laboratory work can be done properly—and it is this that forms the foundation of preventive medicine—what are the necessary factors? It is not enough that there be elaborate buildings with costly equipment. By themselves they do not make a laboratory, important as they are. The essential element is the trained man. Formerly, when the sciences were in their infancy, one man might be an authority along many lines, but today that does not hold good. Men skilled in various subjects are required in order that the work be handled correctly. There must be bacteriologists who can isolate the causative agent from the materials obtained for examination, and find out, if possible, the life history of the organism so as to know how to stamp it out. Pathologists are necessary in order that there can be an understanding of the changes that are produced in the body by the infection. Epidemiologists who can suggest and carry out ways and means of preventing the spread of disease must be secured. Others who are versed in the control of water supplies and sanitation must be found, and chemists are needed to keep a watchful eye upon the purity of the food that has to be used in such tremendous quantities. There is almost no limitation to the variety, and very little as to the number, of the men who will have to take up these numerous activities.

Necessary as the above men are, yet of almost equal importance, in

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order that the work be done quickly and thoroughly, is the obtaining of assistants skilled in laboratory methods; men who can take much of the routine mechanical labor away from the more highly trained individual. The work of the assistant may not be that which appears before the public, yet it is a most important factor. The output of many a laboratory specialist has been made possible through the energy and ability of his assistant.

Considering the men and the buildings together as constituting the laboratory, what is the great duty that it is today called upon to perform? Its most important function is, without doubt, to safeguard the men who are called to the colors, either on duty at home or abroad. There probably never has been at any previous period of medical history so great a demand for preventive medicine as now exists. At no time have there been so many men collected in such great number in so widely scattered areas of the world. We have to consider those who are in the front line of Europe, Asia and Africa, those who are taking their well-earned rest after duty, and those who are collected in this country and abroad to undergo the training that is so essential.

In order that the health of the troops be guarded, it is necessary to obtain both laboratory men and laboratory material. As the number of those to be cared for is so great, it is self-evident that many trained men are required, and the question arises as to where they are to be found. At the beginning of the war the personnel, both officers and enlisted men, of the regular army was barely large enough to look after the needs of the small army that then existed. Since the war began the officers of the regular medical corps have been outnumbered twenty to one by the volunteers. On account of their training in military as well as medical matters, it is the regular army surgeon who has been called upon to assume the important administrative work, while it is upon the volunteers that a larger part of the actual active professional work has devolved. It is from these latter that the men are to come who are to do the greater part of the laboratory work. As already stated, these men will be the ones who have had special training along certain lines. Many of these, however, may not have had experience in some of the latest developments in laboratory technique. For them there are being conducted, in various places, special courses so that they may acquire, not only the newest methods, but also a more or less uniform technique.

In order that these officers can carry on the work to the best advantage, it becomes necessary that they have trained assistants. If the enlisted personnel of the present army is considered, one realizes that it must contain many men who have had experience in many branches of science. It is but a matter of common sense to appreciate the fact that the trained man should be given work that would make use of his abilities, and also that the untrained man must be content with that

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which does not require special skill. In going over the records of the enlisted men there are many found who are graduates from college, and who have done laboratory work of various kinds. To set such men digging ditches would be a waste of good material. These men are, as far as possible, being trained for laboratory assistants.

At Fort Leavenworth, Kansas, in the Department Laboratory under the command of Lieut. Col. Charles F. Craig, Medical Corps, U. S. Army, there has been established a school in which these selected men are being taught the necssary laboratory technique. These men are for the most part those who have had more or less previous laboratory experience, but, for reasons which will appear later, a certain number of men who have had no previous training are given the course. The task to be accomplished is to take those who are sent and to give them such a course as will make them into valuable aides. Although the course is but six weeks long, much can be accomplished in that period. By the time the course is over the men are ready to be assigned to their special work as members of a mobile field laboratory unit. Such units consist of two commissioned officers and four enlisted men, one of whom is a sergeant, two are privates first class, and one is a private. The fact that one man out of every four stands a chance of being made a sergeant, and thus being in charge, is a great incentive to earnest work. The fourth man is, usually, the one who has not had much preliminary training, but who is able to do the work requiring less skill.

The course starts with the most elementary details of laboratory usage. The care of the laboratory itself, of the animals employed, and the necessity of keeping everything in order is taught them. A point to emphasize is the importance of care and economy in handling supplies, as there never was a time when the necessary materials were so expensive or so difficult to get as at present.

Instruction is given in the cleaning of the various kinds of glassware employed, both new and used. As the men have to do the cleaning there is no question as to the experience obtained before the course is over, as in one day's work as many as fifteen hundred tubes of culture media and seven hundred petrie dishes have been used.

After the methods of cleaning have been given, the various methods of disinfection are gone over. The relative value of the different substances and the reasons for using them are lectured upon. That in turn brings up the matter of sterilization and the various ways by which it can be accomplished. They are taught its importance, how absolutely essential it is in order that the bacteriological work shall be performed satisfactorily.

In order that the class shall understand the reasons for the methods so far given and for those to come, considerable time is devoted to bacteria; their classification, physiologic characteristics, the require-

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ments necessary for their growth, and the results of such growth. This is followed by instruction in staining methods and in the actual preparation of the stains. In order to avoid damage as far as possible, the microscope and its use are fully described. Smears are made, stained and examined so that the men may become familiar with the various types of bacteria, their morphology and their staining characteristics. For this purpose the common forms such as will be encountered in ordinary laboratory practice are used; the gonococcus, pneumococcus, streptococcus, staphylococcus, diphtheria or pseudo-diphtheria, also sputum containing tubercle bacilli, etc., the aim of the course being to make it as practical as possible.

After a certain degree of familiarity has been acquired in respect to bacteria, a proportionately large part of the time is devoted to the preparation of culture media of various kinds, particular stress being placed upon the making of Endo's medium, Russell's double sugar, blood and serum medias, etc. Inasmuch as the class is constantly using large amounts of culture media, considerable experience is gained before the six weeks are over. When the media has been prepared, the class receives instruction in inoculating tubes, in the transfer of cultures, in pouring plates, and in methods of isolating for pure cultures.

In connection with this comes the bacteriological examination of water. The method followed is one based upon those given by the American Association of Public Health, 1917, and the standards adopted by the Treasury Department for drinking waters supplied to the public by common carriers in interstate commerce. In some of the samples examined *B. coli* are placed and have to be isolated.

Bacteriological examinations of milk are also made. *B. coli* are isolated from feces, and broth cultures containing different organisms are given for practice in isolating. Pathogenic bacteria are not employed, as it is thought unwise to take any unnecessary chances where so many untrained men are working.

Although a large amount of time is devoted to bacteriologic methods, the other branches of laboratory technique are not neglected. The making of blood examinations, such as red and white counts and the estimation of hemoglobin, are taught. The preparation and staining of blood smears and the making of differential leucocytic counts are carried out and repeated time and again until a considerable degree of skill has been acquired. Instruction is given also in obtaining blood for the Wassermann reaction and for blood cultures.

Considerable time is devoted to the chemical examination of urine; the qualitative tests for albumen and sugar are employed, as are certain of the quantitative tests for the latter. The reactions for the detection of indican, acetone, and diacetic acid are given.

Feces are examined for the ova of the more common intestinal parasites, special attention being given to the detection of the hookworm eggs. As plenty of material is on hand, the men study the actual ova.

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The methods employed for the detection of typhoid and paratyphoid carriers are presented, and, for the sake of practice, the students are required to isolate the *B. coli* from specimens.

The routine examination of gastric contents is given in considerable detail.

Out of every three-hour period the time is usually so divided that one hour is spent in lecturing, while the remaining two hours are given to actual practice. On account of the number of men under instruction, a few over one hundred, it is at present necessary to divide the class into two sections. While the morning division is at work, the afternoon class gets an hour's quizzing, and in the afternoon the morning section gets its quiz. In the evening there is a study hour at which time every man has to be present. In addition to the above there is a written quiz held on Saturday mornings, and at the termination of the course a final examination is held.

So far the men have shown much interest and have done surprisingly well. There have been some, of course, who through lack of education have been unable to keep up, or who through a distaste for the work have asked to be transferred. As only those who wish to make good are desired, there has been no difficulty in getting rid of those who wish to leave and in having other men assigned who were anxious for the work.

If at the end of a course there are men who have not been assigned to a unit they continue in the laboratory. They are given opportunities to do more advanced work that is based upon the instruction that they have received. In this way they become more and more expert and consequently of greater value. So far practically every man has had quite an additional amount of training.

From the results obtained it would seem that such a course as has been described will solve the difficulty of supplying trained men for work as laboratory assistants.

In addition to the above work along professional lines, the men receive an hour's drilling every day in order that they shall become familiar with that basic factor of the soldier's training. Talks are given on the regulations and the customs of the service, and Mason's Handbook is studied. Those men who have been made sergeants, and consequently will be in charge of the enlisted men of the unit, are given a thorough course in regard to the paper-work that will form so large a part of their duties; such as the making out of pay-rolls, muster-rolls, the many forms of reports, the proper method of writing official communications, etc. For this purpose Ford's new text-book on medical administration is used.

The desire is that the men, when reaching their assignments, will be able to look after both the professional and the military branches of their activities in a capable manner.

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CURRENT LITERATURE

Malaria

The mere statement of the fact that the "Tropical Diseases Bulletin," Vol. 11, No. 1, of January 15, 1918, publishes the abstracts from 89 original contributions on malaria, 74 of which were reviewed by A. Alcock, 12 by A. G. B. and 3 by J. B. Nias ought to be proof sufficient for the renewed and widespread attention which this disease has attracted among medical men during the present war. All the different phases of the disease, ranging from the general biology of the parasites to the treatment of infected patients, appear to have been subjected to renewed and more critical examinations than ever before.

THE MILITARY SURGEON cannot escape the obligation to its readers of noting a few of these. Thus, John D. Thompson, in his "Notes on Malaria," is quoted as closing his paper "with an account of some final phases in the development of crescents which have not hitherto been described." A series of crescents of both sexes were observed; the maturation, by expulsion of polar bodies, was equally exhibited in both sexes; in both sexes a limiting membrane was observed, thinner in the male, in which it gives way diffusely to allow of the escape of the gametocyte; thicker in the female, where it usually gives way in a definite region near the middle of the concavity of the curve, whence the gamete is extruded, leaving an empty shell behind with, sometimes, the polar bodies remaining adherent to it!

With regard to the "pernicious symptoms" so frequently supervening in malignant tertian, David Thompson, in his "Diagnosis and Treatment of Malarial Fever," is quoted as attributing these to embolism through the clumping of the red blood cells in the vessels of the internal organs where the parasites chiefly sporulate.

With reference to the treatment of malaria, Ravaut, Reniac, de Kerarel and Krolunitzky, in "Le paludisme d'Orient vu a Marseille," are said to state that, after trying intravenous injections of novarsenobenzol and quinine with good but not permanent results, and subcutaneous injections of atoxyl and quinine with only moderately good results and autohemotherapy which they were not satisfied with, the authors decided that quinine and arsenic combined was the simplest and best method. They further concluded that the treatment of malaria in the army is as much a matter of military discipline as of medical knowledge.

One of the most illuminating papers abstracted in the bulletin before us is the one by Castellani (Aldo), easily the most experienced in tropical diseases, in his "Notes on Tropical Diseases met with in the Balkanic and Adriatic Zones." The inconstancy, mutability, variations in symptoms, complications and puzzling disguises which the disease

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assumes are truly astonishing. In the Balkans Castellani has observed malaria hidden under almost every conceivable mask imaginable, a few examples of which may be cited: One instance of hemorrhagic malaria of a severe scorbutic type; cases of pernicious anemia, treated for months as such, until the appearance of subtertian rings and treatment by quinine led to rapid recovery; profound anemia and other symptoms suggesting cancer, where crescents were discovered and quinine proved efficacious; polyneuritis simulating wet beri-beri; malarial syndromes of the central nervous system, the comatose type, the delirious type, confused with D. T., one case simulating cerebrospinal; cases suggesting hemiplegia, monoplegia or cerebral tumor, one case of clinical transverse myelitis, another resembling disseminated sclerosis, both due to malaria; two cases of mania, one of apparent melancholia, all cured by quinine; malaria counterfeiting infectious diseases such as typhoid, malta fever, yellow fever, hemorrhagic jaundice, tetanus; malarial pseudo-dysentery, malaria pseudo-cholera, cholecystitis syndrome, pseudo-appendicitis (several cases), pseudo-peritonitis; dry bronchitis and dry pleurisy; cardiac and vascular complications; syndrome of angina pectoris, periph. arteritis and gangrene, intermittent claudication, erythromelalgia, acroparesthesias, palpitation, tachycardia, arhythmia and heartblock, all due to malaria; orchitis and priapism cured by quinine. Herpes, urticari, erythema, edema suggesting calabar swelling and a spotty eruption suspected to be smallpox were observed.

Werner (H.), "Die Malaria im Osten, etc."—*Münch. Med. Wach.*, October 23, 1917, believes in the inheritance of the malarial infection in the mosquito.

Kirschbaum, "Zur Epidemiologie der Malaria," *Münch. Med. Wach.*, October 23, 1917, from observations made in northwestern Russia, concludes that an outbreak of malaria in the infected may be retarded by the extreme cold.

Appel (Leo), "Ueber die Ursachen der Malaria Rückfalle," *Wien Klin. Woch.*, July 19, 1917, from some of his observations in the malarial laboratory of Tarajeroo, believes in the influence on relapses of a disturbed barometer, having noticed that relapses occur on particular days having no relation whatever to the development cycle of the parasites. "On certain days, and often at the same hour, a whole concourse of relapses occurs, and then, for some days, among hundreds of patients, only two or three have fever. The examination of the blood concurs." The phenomenon is said to be uninfluenced by the mean temperature or the duration of sunshine, while *"sudden falls of the barometer coincide with relapses."*

Five cases of malarial mammitis are reported by Carnot and Bruyère; two cases of malarial gangrene by Paisseau and Lemaire; one case of pernicious malaria with a tetanic syndrome, dying 24 hours after the onset, by Majoli and Paoletti.

Teichmann's (Frederich) observations in "Klin a exper. Studies on

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Quinine Habituation" and the "seeming Quinine-Fastness of mal. plasmodia," if confirmed, would be of fundamental importance with regard to the treatment of malaria. This author, who writes from a military hospital in Turkey, after having experienced, like many of us, the failure of quinine as a prophylactic and many relapses after months of treatment of many cases of the disease, is led to believe these failures to be due to a quinine-habitation of the body. To test this hypothesis, Teichmann examined the blood and urine for quinine in a large number of patients and thus found that, while in the non-quinine habitués considerable quantities of quinine were actually found, in the blood and urine of the quinine habitués, after a certain interval, quinine was hardly demonstrable or only in very small quantities, gradually reaching zero. It is naturally assumed that quinine, after some time, becomes fixed somewhere in the tissues, disappearing from the circulating medium, and therefore, is not available for attacking the parasites. On the other hand, the quinine fastness of the parasites is supposed to be only apparent; these are said to remain sensitive, but the quantitative concentration of quinine in the blood is insufficient to kill them.

Teichmann tested these conclusions by gradually raising the doses of quinine, at the same time lessening quinine habituation by leaving off the drug for suitable intervals. Patients were treated thus: Two to four weeks, according to the degree of quinine-habituation, no quinine, 8 days pause. Two days quinine treatment as above; 10 to 12 days pause; ten days treatment. Lastly, 1.2 gm. of quinine on two successive days in each week for six weeks. It is stated that this method has been completely successful in obstinate cases—the malarial parasites disappeared; the general condition improved; the hemoglobin reached the normal, and during an observation period of 6 weeks there were no relapses. In conclusion, the author states that he is not against the prophylactic employment of quinine, but urges its systematic and careful use, and believes that, if malaria occurs in such cases, it should be treated by intermittent quinine in rising doses" (A. G. B.).

The reviewer regrets being obliged, on account of limitations of space here, to interrupt this survey of one of the most interesting and instructive collections of the recent literature on malaria. The ambitious student, in pursuing it further, would soon succeed in convincing himself of how little he knew on a subject the knowledge of which had apparently reached its limits but a short time ago.

H. G. Beyer.

Methods of Control of the Clothes Louse, *Pediculus Tumanus Vestiments,* by William Moore, St. Paul, Minn. *The Journal of Lab. and Clin. Medicine,* Vol. iii, No. 5, February, 1918, pp. 261-268.

As a result of the work with sachets, the author states that compounds such as naphthalene, camphor, or paradichlorbenzene do not

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volatilize rapidly enough to make good the loss incurred by leakage through the clothing. Compounds with lower boiling point than the above named, such as xylene mixed with Fuller's earth, *might* be used successfully as sachets, but the expense of treatment is prohibitive.

The author, after experimenting with 37 different louse powders with more or less success in killing lice in the laboratory, recommends a powder consisting of 1 cc. of creosote, sulphur ½ gram, and talc 20 gms., and which he states "will kill 100 per cent of the lice in 5 minutes," adding, however, that "the soldier in general objects to insect powders, since effective powders are inclined to produce irritation, particularly when the soldier is perspired, while powders which do no harm are of no value." The second point is "the enormous quantity of powder which would be necessary to effectively treat the great numbers of men at the front. Using two ounces of powder every day or two, which quantity would be necessary for a thorough job, would mean 1,250 pounds to each division of ten thousand men."

With regard to the subject of the "Impregnation of Underwear" with active volatile organic compounds, we interpret the author's opinion to be that the irritation of the skin, produced by quantities of such compounds to be efficient in louse destruction, would make their employment prohibitive or impracticable, and that smaller quantities would be of no use.

The author sums up the results of his work in (1) recommending a powder, consisting of talc 20 gms., creosote 1 c.c., sulphur ½ gm., and which is said to be six times as effective as a louse powder, besides causing less irritation to the skin and, being dry, is easier to apply. (2) Sachets are not successful. (3) While impregnation appears not promising, a cheese cloth suit, impregnated with saturated solution of sulphur in creosote, might be worn successfully outside the underwear. (4) Chlorpicrin, as a fumigant, penetrating the clothing, kills the lice in all parts of them in fifteen minutes and the eggs in thirty minutes.

With reference to some of the methods used in louse extermination, as seen in practice on a large scale, the student interested in the problem might with advantage to himself consult an article published in THE MILITARY SURGEON, Vol. xxxviii, No. 5, May, 1916, pp. 483-491.

H. G. BEYER.

Remarks on Dichloramine-T., by Edward Dunham, M.D., New York. *The Use of Dichloramine-T in the treatment of Infections and Infected Wounds*, by Lieut. Walter E. Lee, M. R. C., and Capt. William P. Furness, M. R. C., Philadelphia. *Surg. Gyn. and Obst.*, Vol. xxvi No. 2, February, 1918, pp. 152-159.

Students and practitioners working on infections and infected wounds cannot well afford to miss the above two papers and should

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take the valuable lessons described in them. These papers complement one another, the one by Dunham furnishing the master key to the understanding of the other, by Lee and Furness. Both papers are of fundamental importance. The former, in briefly reviewing the chemical constitution attributes, reactions, modes of behavior under different conditions, of choramine-T, prepares us for an understanding of the remarkable action of this substance when applied to wounds in an oily solution, and which forms a strange contrast, when compared with any of the other members of the chlorine group of disinfectants, in watery solutions. The latter points out the way toward the adoption of a more painless, a more humane, a more rapid and a more successful method of treatment of bacteriologically infected wounds than any in use hitherto, not the least advantage of which is the elimination of the complicated technique, hitherto employed with such excellent results and devised by Carrel.

Briefly stated, the difference in mode of action between aqueous and oily solutions are these: "When the method of intermittent instillation is employed, the result is a series of sharp but brief antiseptic shocks, tapering off to nothing on account of the less rapid action of the protein chloramines formed in the early moments of maximum chlorination" (Dunham).

The chlorine in chloramine-T, being already linked to nitrogen, is less ready to suddenly part with the latter and, consequently, chloramine-T proves less irritating and can be used in greater concentration.

Dichloramine-T owes its exceptional position to the fact that its solutions in oil, according to Dunham, can be used up to 20 per cent and this, seemingly, excessive mass can become effective without undue irritation. (In a footnote to his paper Dunham states that it has been found possible, since he wrote his paper, to replace chlorinated eucalyptol as a solvent for dichloramine-T with a chlorinated paraffin wax, a liquid to which the name of "chlorosane" has been given.) "The renewal of antiseptic coming into play in the secretions is automatic and persists until the store in the oil has been exhausted." (Dunham).

Lee and Furness state (p. 157): By using oil as a menstruum a large mass of germicide was brought to the infections and yet held so firmly in solution that it very slowly diffused into the surrounding medium for at least as long as eighteen to twenty-four hours, and during this period a mass of germicide was at all times active which was equal to that given off during the first seven to fifteen minutes by the hypochlorite solution." A 20 per cent solution of dichloramine-T, being approximately 80 times the germicidal mass of a 0.48 per cent hypochlorite solution," doing such satisfactory disinfecting work, without producing irritation, seems like a remarkable discovery of the storage capacity of certain oils for chlorine and of their paying it out on demand.

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The authors make it plain, at the end of their papers, "that neither chemistry nor bacteriology can or should be expected to replace the mechanics of surgery."

H. G. Beyer.

L'Organisation Sanitaire des Armées, considered from the point of view of the Treatment of Wounds by the Interallied Conference of Surgeons, by Professor Depage, Director of the Ocean-Hospital at la Panne. *Arch. Med. Belges.*, 71e Année, No. 2, February, 1918, pp. 113-123.

The conference at which Professor Depage spoke took place on December 1, 1917. He frankly declares himself dissatisfied with the lack of progress made in the sanitary organization of armies, saying, "the machinery has remained the same, the directing principles have not varied, the military hierarchy has always been the essential basis." He bitterly deplores the lack of system and order in the evacuation of the wounded from the front to the rear and the absence of uniform rules and regulations governing their treatment on their way.

"If I should," he writes, "some day write up the history of the sanitary service of armies, I would willingly accord this period the term of 'administrative period,' in order to contrast it with the second period, 'the scientific period,' which began to assert itself from the moment the method of Carrel was introduced into surgery."

On the first of July, 1916, he and his colleague Debaisieure expressed themselves as follows: It is indispensable to bring about a more intimate union (liaison) between the hospitals at the front and the sanitary units in the rear in order to create and maintain constant touch between the different physicians and surgeons to whom the care of the wounded is consigned. To this end it is essential that the hospital always evacuate its wounded into the same place of the interior, analogously equipped and working with the same method." Their ideas were, in brief, those of bringing about a uniformity throughout in the transport and the treatment of the injured, an unbroken continuity toward their recovery. The conference was at one with the recommendations of the authors.

The further modifications elaborated by the French bore on four principal points: (1) Surgery of the non-transportable; (2) the early recuperation of the wounded; (3) perfection of instruction of the surgeons; (4) realization of continuity in the technical supervision and care of the injured. These points were treated in a report by Dr. Duguet at the last session of the interallied conference of surgeons, on the 10th of October, 1917.

Some of the beneficent results obtained through the adoption of the above enumerated principles and the elaboration of them in actual practice are summed up by Dr. Duval at the same session of the con-

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ference. "During the battle of Flanders, Amiens received the wounded cared for at the front. There was neither a death nor cases of gangrene or tetanus; only one amputation during the third week. Eighty-four per cent of the injured were sutured within an average of eleven days and cured from the fifth week on; 30 per cent of the injured had a leave of absence of but seven days, 32 per cent one of a month."

"During the recent battle on the Aisne, 80 per cent of the evacuated, after intervention, justified suturing; 50 per cent were sutured during the first two days, all of which excellent results Dr. Duval attributes: (1) to the method of surgical treatment, (2) to the reorganization of hospital services—"La liaison fut complète."

But, as stated by Duguet (p. 119): "Trench warfare has permitted this transformation, but let us not forget that the resumption of open warfare may upset it profoundly."

H. G. Beyer.

War Neuroses, by Lieut. John T. MacCurdy, M.R.C. *Psychiatric Bulletin*, July, 1917, pp. 112.

Lieutenant, now Captain, MacCurdy brings to his subject an unusually valuable experience. Upon the foundation of a broad psychiatric training in the Psychiatric Institute of the New York State Hospitals, he has constructed a study based upon cases of shell shock observed in seven hospitals in England. He does not favor the term "shell shock," first, because of its false implication of a single etiology, and second, because the clinical types covered by this forensically picturesque term are too various to be gathered under this blanket head. He seems justified in regarding "War Neuroses" as more satisfactory.

Two main types are distinguished—anxiety states and simple conversion hysteria. An illustrative case of each is given at the outset. No statistics have been available to him as to the comparative numbers of neuroses developing in the different armies, but it appears that these neuroses rank with the more important conditions other than wounds, tending to remove men from active service. The war neuroses appear to be closely associated with modern methods of fighting. The first reports of these conditions came from the Russo-Japanese war. From the South African war they appear to be absent.

The paper deals almost exclusively with the mental side of the disturbances and discusses them from a standpoint of modified psychoanalysis. Symptoms are thus found directly determined by wishes fully conscious to the subject, simple therapeutic measures leading rapidly to permanent recovery, but with a chronicity of symptoms for which proper treatment is not given. The essence of his formulation is as follows:

A primitive instinct, taking delight in brutality and savagery for themselves alone, is assumed. This instinct is excessively individualis-

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tic and becomes suppressed with the growth of social civilization. A proper adaptation to warfare involves a lifting of this repression and a "sublimation" of the instinct. A sublimation is an outlet to primitive individualistic instinct so constituted as not to be repugnant to society or to the social instincts of the subject. This condition is met in war, for there a premium is put upon bloodthirstiness and the community extols the individual who is the most effective in doing physical injury to the opposing group. Against the development of this sublimation, there operate first the mental habits of men for years educated with ideals of gentleness; second, a general feeling of unity to mankind which makes one sensitive to suffering also in those outside his own social group. In the normal soldier, these factors are insufficient to prevent the development of a war sublimation that takes delight in the essential activities of war. Factors which break down the sublimation, or prevent its establishment, bring about the war neurosis. It is significant that the changes of modern warfare have operated to make the sublimations much more difficult than in previous wars.

"Now the soldier must remain for days, weeks, even months, in a narrow trench or a stuffy dugout, exposed to a constant danger of the most fearful kind, namely, bombardment with high-explosive shells which come from some unseen source, and against which no personal agility or wit is of any avail. This naturally occasions great fatigue, and, on the other hand, opportunities of active hand-to-hand fighting are rare, so that a man may be exposed for months to the appalling effects of bombardment and never once have a chance to retaliate in a personal way."

With the war sublimation weakened or lost, the soldier becomes exceedingly sensitive to the horrors about him, as the civilian would be who had had no opportunity to develop a war sublimation. There even develops a pathological pity for the enemy. Individualistic feelings assert themselves, with resentment against the state that exposes him to such hardship. Altogether, it is only through the "war sublimation" that the soldier's life is even tolerable. When this fails the mind looks, consciously or unconsciously, for something which will relieve him of the necessity of fighting. Thus it is that the symptoms of the war neuroses are directed specifically against the man's capacity to fight.

In general, neurotic symptoms are conceived as arising from failures of "sublimation." In the present instance the war furnishes a difficult situation. If sublimation fails, neurosis appears. In the life of peace the nearest analogue is found in the difficulties centering about adaptations in the sphere of sex. Apparently, the lack of adaptability that leads to a war neurosis is general in character and is likely to have shown itself previously in meeting the demands of sexual adaptation.

As an indication of the soldier's future adaptability, the duration of his fear reactions upon his baptism of fire seems to be more impor-

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tant than their initial intensity. If he cannot recover quickly from the initial fear, etc., a super-fatigue ensues that results in disabling symptoms. There is mentioned the possibility that toxic products of this neuropsychic fatigue are of direct significance in causing the neuroses.

Anxiety conditions in the pure state are almost confined to officers. They are ushered in by feelings of tenseness, irritability, difficulty of concentration, restless desire for action, "jumpiness." There is usually a slight improvement towards night. More distinctive are the nocturnal symptoms. There are long periods of hypnagogic hallucinations, usually of occupational character, and sleep is much reduced. After a time there develops the above-mentioned cumulative horror of war. Fear develops with loss of judgment of the direction of the shells. Every shell seems aimed at the sufferer personally. In the officer the fear develops that he may not hide his fear, and this vicious circle continues.

The mental symptoms now begin to be influenced by the three practicable avenues of escape, namely, death, capture, or an incapacitating wound. The anxiety neurosis represents a higher ideal of duty than the conversion hysteria, and the idea of the disabling wound is not found among its symptoms. "Nor do they consciously seek surrender, but it is interesting that they often dream of it at this stage." The idea of death is the most frequent, as offering a complete release consistent with all standards of duty. The complete breakdown regularly ensues soon after the death-wish has become fixed. As a rule, the breakdown is precipitated by some mental accident, as seeing a close friend killed; or a physical one, as burial by an exploding shell. Refusal of a hoped-for leave is sometimes a precipitating factor. The severer symptoms may be ushered in by a stuporous state, with hypnagogic hallucinations. Later violent nightmares supervene. These have a war content; the patient is always powerless to retaliate, and the fear is much greater than in similar waking situations. Indeed, little sign of fear may be apparent during the day.

Photophobia is noted in the acute stages, and tremors seem to be always present, most frequently in hands and arms. Disturbances as of the thyroid are frequent, usually of short duration. Tics, such as grimacing or withdrawal of the head as from something unpleasant, are occasionally seen. A drawn, fatigued face, showing emotional strain, is sometimes typical enough for diagnosis. There is increasing preoccupation with self, a loss of spontaneous affection, even of capacity for ordinary social contacts, that is subjectively painful.

"To the man who is visited by his mother, his wife, or his sweetheart, it is a disappointment both to himself and to his visitor, in that it is impossible for him to give any convincing proof of his affection."

These symptoms continue for periods of weeks to months, but tend to abate gradually without specially painstaking treatment. The dream-life improves, occasional settings from normal civilian life

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being introduced. A distinctive change in the nightmares may be seen.

"For some time dreams will proceed, in which the enemy is invariably successful and the dreamer powerless. Then the dreamer begins to show fight, and for some nights may struggle, although still defeated. Next, the battle becomes a draw. Finally, the dreamer begins to get the upper hand and is able to enjoy the fight of which he dreams, because he invariably punishes the enemy."

In reaction to the feeling of disinclination to realized duty, emotional depression appears. The patient feels, too, that he is not being treated well, this probably growing out of his own self-centeredness and abolition of previous social contacts. This final phase may last indefinitely without appropriate mental treatment

At the outset of treatment the patient should go to a quiet environment. It is often noted that symptoms are aggravated upon reaching a hospital, this being an unconscious manifestation of the impulse, itself conscious or unconscious, to get away from the fighting. The worse impression he makes, the longer the probable absence from the front. The separation from the war should not be too complete; otherwise ideas of permanent absence may arise to obstruct complete recovery. The hospital should be in the same country where fighting is going on. Absolute rest in bed, to produce as normal sleep as possible, should be the first treatment. The greatest difficulty in combating insomnia seems to be met with in the hospitals with greatest reliance on drugs.

"If, on the second night, no sleep is obtained by hydrotherapeutic methods or suggestion, a milder dosage of a hypnotic may be effective, and for this a placebo may be later substituted."

This period, when the patient is recovering from actual fatigue, should be kept brief, so as not to foster invalidism. The period in which no demand is made for the patient's coöperation in treatment should not be over two weeks. The effort must be induced to forget the war for the time, without fostering the idea of being out of it for good. Occupation should invariably be given, by means of well-equipped workshops; courses of study also are suggested for officers. A judicious granting of short leave from the hospital, throwing the patient briefly on his own resources again, is helpful in restoring self-confidence. The physician should let the patient feel that he has sympathy for him, but none whatever for his symptoms, thus helping him reëstablish his social contacts, without encouraging a feeling of dependence. But the fundamental difficulty of antagonism to military duty can be eradicated only by the patient gaining some psychological understanding of his symptoms.

"When once the patient sees that his disinclination to return to the front is essentially a selfish desire to avoid his responsibility as a citizen, he is in a position to decide quite consciously whether he wishes to be a slacker or to assume his share of the country's burden. If he

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has the right stuff in him, he becomes ashamed of his symptoms and begins to control them quite speedily. He is soon eager to take some part in the struggle, and if he is given light duty which does not make too great a demand on his capacity, this capacity grows, and with it a desire to return to the field of active operations appears. Probably nothing is gained by an attempt to send a man back to the firing line who does not spontaneously wish to be there. Each patient has learned that the development of certain symptoms will cause his removal from the trenches, and if he consciously desires to be out of them he will make little effort to combat their redevelopment."

This concludes the discussion of the anxiety states, which occupy the greater portion of this study, with fifteen case histories. In the conversion hysterias there is a dissociation involving some physical function. The idea is now "converted" into a physical symptom. The more important and frequent of the symptoms are such as obviously incapacitate for active duty. Mutism seems to be commonest; monoplegias, paraplegias, contractures and the like are also seen. Fatigue is not so well marked as in the anxiety states; there may be little disturbance of sleep. Comparing the anxiety condition and the hysterical symptom, it is seen that the latter represents a relief from duty on a plane incompatible with the higher standards of officers. The anxiety state does not play with the idea of an incapacitating wound, "a blighty one," but such wishes were found in every hysterical case examined except one.

These feelings of antagonism to military service, with the idea of release, make up the background of the hysteria. The hysterical symptoms themselves have a precipitating cause, frequently a concussion. As with anxiety cases, hysterical symptoms are not precipitated at the time of the actual trauma, but often develop during the period of convalescence from a wound. The pain or disability is not recovered from. This complicates the diagnosis of organic and functional, but the most difficult problem is to differentiate from malingering. One should inquire into the mental attitude of the patient before onset. A more frank admission of distaste for fighting is apt to be obtained from the hysterical case.

Prognosis depends much on the original personality. Those of psychoneurotic make-up develop new symptoms as the old ones are done away with. More normal soldiers are glad of a cure and rarely suffer relapse. Disciplinary treatment is logical if the symptoms are under conscious control; and if the fear of punishment is greater than the fear of service, the symptoms will tend to disappear. The natural suggestibility of the well-disciplined soldier contributes to the result. Such cures are few and apt to be temporary. Undue coercion may build a still firmer foundation for neurotic symptoms. The results of massage and electricity, while more favorable than disciplinary treatment, are also dependent wholly on suggestion. The objection to em-

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ploying suggestibility as a therapeutic agent is its direction at symptoms rather than causes.

"To the uneducated soldier the symptom has come from nowhere, and if it is removed by the suggestion of electricity or the more direct suggestion of hypnosis it leaves him through the agency of a miracle; consequently, his mind is strongly imbued with the idea that such things can happen, with the not unnatural result that they do happen again. What should be aimed at is much more the training of the patient to control the workings of his mind, steadily combating the idea that there is anything miraculous or lawless about the functions of his body which have gone wrong. What is essentially reëducation is, therefore, without any question, the best method of treatment for the conversion hysterias."

Those who are most successful begin with making the soldier understand that he has simply forgotten the lost function and must learn it over again. A trick, or even hypnotism, may be useful in demonstrating that the function is not vitally affected. Many examples are given.

A few cases of heart neuroses are cited. In a number of such conditions, according to the work of Frazer and Wilson, the vegetative or endocrinic nervous system is disturbed. The author examined ten cases selected for him by Wilson as those most likely to be purely neurotic. He diagnosed true neurosis in only two cases. It would appear that the majority of those suffering from "disordered action of the heart" are not neurotics in the narrow sense of the term. But certain heart cases have a coloring of anxiety, associated with wish for death before the actual symptoms. Others wish rather for the incapacitating wound, and then, when the heart symptoms develop, they are regarded more as a disease, without the same anxiety.

It is pointed out that the resistance (in the war neuroses to military duty) can be present consciously at the same time as it operates unconsciously to produce the neurotic symptoms. In civilian practice the resistances encountered are regularly present unconsciously only. The clear differentiation of the officers by anxiety neuroses and of enlisted men by conversion hysteria has its civilian parallel in the greater frequency of these conversion hysterias among the lower and less educated classes. The conversion of the wish for a disabling trauma into the hysterically disabling symptom is comparatively simple, but the transformation of the officer's death-wish into the anxiety symptom is more difficult to understand. The nightmares, the most distinctive features of the anxiety state, do not seem to develop till the death-wish has appeared.

"It is possible, therefore, that the unconscious mind seizes on that in the environment which is most likely to occasion death and makes the patient dream of this danger. The 'wish-fulfilment,' therefore, in the dream of being shelled or bayoneted may be ascribed to the wish for

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death, which may previously have been rather diffuse and now becomes specifically allied with one particular form of mortal danger."

A hypothesis is put forward to account for the anxiety in the nightmares replacing the previously calm desire for death.

The loss of ability to gauge the direction of shells "gives a beautiful example of how the unconscious works at cross purposes from the conscious mind. The patient has consciously no fixed and constant desire to be hit by a shell. Unconsciously he has, however; so, in the fatigued condition from which he suffers, the unconscious warps his judgment, making every shell the fulfilment of the unconscious wish."

By way of prophylaxis, it is urged that all possible be done to eliminate at enlistment the men not adapted to fighting. Persons with marked psychopathic tendencies in their history, or who show psychoneurotic traits at the time of examination, may be used elsewhere than in the trenches. On the other hand, MacCurdy draws attention to many cases of psychopathic make-up who adapted themselves well to combatant life, and even fought indefinitely. He considers that in military discipline exists a "powerful therapeutic agency, and that not only the country as a whole, but many individuals, would lose a great deal if they were denied service in the army simply because they could show a history of some psychoneurotic disturbances in the past." It is suggested that much better opinions could be given if recruits were examined at the beginning and near the end of the training period.

"Although I have seen many cases showing neurotic tendencies who improved under training and became excellent soldiers, I have not seen one who failed to improve under training whose condition became better when he was actually in the firing line."

Much is to be gained from early access to the cases. Early rest gives opportunity for prompt return to the fighting line, but when the disease has progressed to a certain point, apparently indicated by repeated nightmares of actual fighting, long treatment is practically always necessary. Much may be lost by sending men back too soon. The extra week or month away from the trenches matters little beside protracted convalescence following a few days of perhaps efficient service after premature return.

F. L. Wells,
Captain, M. R. C.

Everything The Association has advocated during its quarter of a century existence, the sole *raison* for its existence during all these years, is culminating in the greatest military medical organization the world has ever seen. Surely the veterans will foregather with our younger members to see the fruition of their work and thank God that they were permitted to help in so great an undertaking. Make no Other Engagement for Monday, Tuesday and Wednesday, October 14, 15 and 16, 1918, the Days of the Annual Meeting at Camp Greenleaf.

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BOOK REVIEWS

Medical Service at the Front, by Lieut. Col. John McCombe, C. A. M. C., and Capt. A. F. Menzies, M. C., C. A. M. C. Philadelphia: Lea & Febiger, 1918. Price, $1.25.

One of the series on medico-military subjects published by Lea & Febiger, this monograph gives a brief but understandable outline of medical organization in the theater of operations, as practiced by the British Army. Of course, such organization is essentially the same in all armies, as the problems are identical, the only difference being in the means. The British organization is distinctive in its "Field Ambulance," a combination of our field hospital and ambulance company, which, we are informed, is working satisfactorily to the British, but which our authorities rejected after grave consideration because of inelasticity. To be sure, these formations are complimentary, so are field artillery and infantry, but we have not heard that this has recently been urged as a reason for their consolidation. The unique feature of the book is the foreword by Surgeon General J. F. Fotheringham, D. G. M. S., Canada.

First Aid to the Injured and Sick, An Advanced Ambulance Handbook, by F. J. Warwick and A. C. Tunstall. 10th edition. New York: William Wood & Co. Price, 80 cents.

Certainly no book which has reached its tenth edition, embracing one hundred and forty thousand copies, needs more than a simple notice of publication to attract public attention.

One who knows this work could hardly believe it would so soon need revision, and yet the authors inform us that they have thoroughly revised the text and made a few necessary additions. Practically everything is included that relates to what to do in emergencies.

A considerable section is given to the transport of the injured, a phase of first aid of much importance, but which seems to make little impression on the public mind. Nevertheless, most of the benefit of excellent splinting and bandaging could be rendered nugatory by improper handling in moving the patient.

It is to teach the best methods in transport of wounded, which depends upon the harmonious working of several persons, that bearer drill has for so long been a part of the instruction of sanitary troops in all armies. The method set forth in this book is, naturally, that of the British service, and might appear to be somewhat complicated, though probably rendered so by the occasional employment of an unusual number of men. The British, contrary to our practice, have found that it takes four men to a stretcher to do good bearer work, and especially so under existing conditions of terrain—and we will certainly find that

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we must modify our bearer formations accordingly. Pictures from the front would indicate that the loaded stretchers are being carried on the shoulders of four bearers, which was considered bad bearer practice. Contrary to preconceived notions, a knowledge of this section, on transport of sick and injured, is quite as important to have as of any other part of this popular manual.

LESSONS FROM THE ENEMY—HOW GERMANY CARES FOR HER DISABLED, by John R. McDill, M.D., F.A.C.S., Major, M. R. C., U. S. A. Medical War Manual No. 5. Philadelphia: Lea & Febiger. Price $1.50.

Major McDill's contribution to this series is most interesting and instructive, giving, as it does, a clear and impressive description of the thorough organization of the German people for the contingency which has now arisen, and which our author illustrates in his foreword as follows: A German mother, needing a certificate of birth of her son, wrote: "Dear Herr Pastor: Please send me a copy of the birth certificate of my son, Johann, who was born on January 23, 1898, for military purposes." A bit grim, but none the less true.

Major McDill treats briefly but clearly the German medico-military organization for war, giving in sufficient detail the administrative methods of the service in its various fields of activity from front to rear, with some account of the interior economy of military hospitals, following with a glance at medical and surgical procedure. Then come chapters on volunteer nursing and welfare work, reëducation and rehabilitation, etc., all making a story well worth while and one which anyone could read profitably and enjoy.

THE SURGICAL CLINICS OF CHICAGO, Volume I, Number 6, December, 1917. Philadelphia and London: W. B. Saunders Company.

In the December number of the Surgical Clinics of Chicago, Volume I, will be found a number of excellent clinics of the same high standard as those of preceding issues.

The field embraced is a large one, including case reports by Dean Lewis, of three cases of Separation of the Lower Epiphysis of the Femur, and a case of Myositis Ossificans Developing in a Clean Incised Abdominal Wound, and another of Blastomycosis. He discusses also Sporotrichosis and explains how this lesion may be mistaken for the former.

Dr. Kretschmer has an instructive clinic on Tuberculosis of the Kidney, of which he presents three cases. Excellent illustrations are used showing the technique of nephrectomy for tuberculous kidney.

Dr. Louis E. Schmidt presents a most interesting paper, a report of A Demonstration and Discussion of the Technique of Prostatectomy, which was given before the members of the American Urological Association. This is one of the most valuable papers on the subject with

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which we are familiar as it presents the subject of prostatectomy in a concise and comprehensive manner.

A. J. Ochsner has an interesting clinic, also Drs. Carl B. Davis and Arthur Dean Bevan. The subject of Anesthesia in Gynecology and Obstetrics is discussed by Dr. C. Henry Davis. Besides several other instructive clinics Dr. Frederick A. Besley has an interesting one on the subject of Fractures, and Dr. Eiesendrath has one on Gunshot Wounds of the Femur.

In looking through the index of Volume I, found in this concluding number, the writer is impressed by the wide field covered. No live subject of the day has been neglected, and he wishes to reiterate what was said in a review of a former number, that every surgeon in the country should be a subscriber to these excellent publications.

JNO. E. SUMMERS.

YEAR BOOK, MEDICAL OFFICERS' TRAINING CAMP, FORT RILEY, KANSAS, 1917–18. Edited and published by Major W. N. Kenzie and Associates of the Medical Reserve.

A record, largely pictorial, dedicated to Maj. Gen. W. C. Gorgas, "who, above all others, has been responsible for the high standing of the Medical Corps of the United States Army, and who now represents to the people of the country the ideal of an officer and a gentleman," is an admirably illustrated and framed account of the doings and accomplishments of that training camp.

Fort Riley has participated as a pioneer in all the advances made in the field service work of the Medical Department in recent years. Here was organized the first modern field hospital, in 1889, crude indeed, largely improvised, but practical, as evidenced in its work during our last Indian campaign and battle. Here was organized the first company of the Hospital Corps, in 1891; here were written the first drill regulations for the Hospital Corps, in 1892, the manuals preceding this being tentative and incomplete; here appeared for the first time, in 1902, the present field hospital and ambulance company, at the first real maneuver camp organized in our Army, and, finally, came the Medical Officers' Training Camp, in 1917—a climax to the development of the field efficiency of the Medical Department.

That it is the climax is evidenced by the pictures themselves, which show how quickly and efficiently civil physicians are being converted into medical officers—a fact upon which the country must felicitate itself, for it is a military axiom that good officers make a good organization.

The editors are to be congratulated upon the Year Book, which has set a standard that others will have difficulty in attaining.

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A Manual of Clinical Diagnosis by Means of Laboratory Methods, by Charles E. Simon, B.A., M.D. Ninth edition, enlarged and thoroughly revised; illustrated with 207 engravings and 28 plates. Philadelphia and New York: Lea and Febiger, 1918, pp. 851. Price, $6.

Students, both young and old, in search of interesting and practically useful information will not look long in the pages of this book before finding their hopes and expectations amply realized.

In the first forty-seven pages, which deal with the very fundamental subject of the "Morphological Element of the Blood," the author describes exhaustively, with the most painstaking details, the different varieties of the red and white blood cells occurring in normal blood as well as in blood under pathological conditions. The well-selected plates and figures accompanying their description appear true to nature and as if cut out from freshly prepared microscopic specimens. Throughout the book the author seems to take no previously acquired knowledge on the part of the student for granted, but unhesitatingly starts with the bottom fact, stopping to explain terms which every beginner absolutely *needs* to have explained and the busy specialist often likes to rehearse. Thus he makes sure of satisfying both classes of students. On every page of the book, the strong, thorough-going individuality of an experienced teacher of students, in laboratory or clinic, must impress itself on the reader. The very difficult, often puzzling subject of the correct diagnosis of the different forms of the blood cells, their classification, distinguishing characters, staining reactions, varying percentages, present under different conditions, in the young and the old, appears to have met with all desirable thoroughness which its great importance demands.

Speaking very generally and apart from the book or its author, while admitting, as a fact, the as yet doubtful origin of a few forms of blood cells, the reviewer nevertheless has received the impression, as if the nomenclature of the different forms of leucoytes could be improved, if the terms, applied to them, could have been from the start so fashioned, as to constantly remind the student a little more of the places of their origin than they now seem to do. Thus, for instance, it comes almost as a relief to the earnest seeker for information to read, on page 42, under the caption "Lymphoidocytes": "These cells represent the ancestral type from which all the different forms of leucocytes and red cells are derived through a process of differentiating reproduction"; or, on page 45, under "Lymphoblastic Macrolymphocytes," that "these cells represent the mother cells of the lymphocytes of normal blood, but are themselves only found here under pathological conditions; their normal habitat is in the germinal centers of the lymph glands which are composed altogether of these cells."

Every student, after following attentively the author's account on the morphological elements of the blood, will agree with the author

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when he states, on page 49, that "no blood examination is accordingly complete in which the differential count has been neglected" . . . and that "if only one count is for any reason to be made, it should invariably be the differential."

The reviewer sincerely regrets that space limitations make an adequate review of the author's work impossible and impose restrictions.

Under the caption "General Examination of the Blood," the widest possible scope is given to the subject. The general microscopic technique, the chemistry of staining agents, their chemical structure and their reactions, methods of mounting specimens and of how to stain them, of blood counting, of hemoglobin estimations, the examination of blood by chemical and physical methods, blood coagulation, blood pigments, the transfusion test, the methods for the determination of the proteins, of blood sugar, of urea, of the total non-protein nitrogen of the blood, of ammonia, uric acid and the xanthin bases, of fats, fatty acids and cholesterin in the blood, etc., etc.—all these seem to have found adequate, conscientious as well as critical and masterly consideration and treatment. The same characteristic thoroughness is noticeable throughout the book.

The pages of the book are filled to overflowing with richly illustrated descriptions of every known morphological, physiological, chemical, pathological parasito-logical, bacteriological and serological methods of examination of the various fluids, tissues and organs of the human body, under conditions of disease, whether tropical or indigenous and, in the diagnosis of which, the aid of such laboratory methods of examination is invoked, in fact, has become an essential and necessary part of the work of establishing a diagnosis. Though a rich mine of information in the widest sense, the book appears to be condensed. To the reviewer it seems, indeed, somewhat surprising that one single individual author could have found it in him to fill a manual so completely full of information, harvested from so large a variety of fields of labor and of knowledge. As a work of reference, it will take the place of a small library. Such a book could not have been written except by one who is a thorough master of laboratory technique, an experienced physician, and a good teacher at one and the same time.

H. G. Beyer.

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INSTRUMENTS AND APPLIANCES

A JOINTED TRENCH STRETCHER

By Captain WILLIAM J. MANNING
Medical Reserve Corps, U. S. Army

(With two illustrations)

The accompanying photographs show a jointed trench stretcher designed especially by the writer for the Belgian government in June, 1917.

It will be noted that, when unlocked, the stretcher can be made to take various trench angles or follow the serpentine lateral or side course of a trench without the bearers lifting the litter above their heads or otherwise exposing themselves or patient to the enemy fire.

The framework is made of heavy 1-inch galvanized iron piping, inclusive of the braces or crosspieces, which are connected together with standard threads; all joints and terminals, inclusive of the stirrups or feet, are constructed of standard steam pipe couplings in order that such can be readily obtained upon the market or carried in stock by the quartermaster for quick repair work upon the field.

Fig. 1 shows a view exposing the upper surface with handles locked. At the points marked *A, A, A, A,* the end of a round, one-half inch, steel pipe is seen protruding; this extends through the pipe handles in a horizontal direction on each side, up to and through the joint or break marked *B, B, B, B,* on each side. No. 1 or No. 2 man, when it is desired to unlock the litter handle, simply withdraws the ends of these projecting rods or small piping (*A*) slightly (a stop-pin transfixing draw tube limits withdrawal movement), which as a result disengages the rod from the joints (*B*) and permits the break or turning movement in any direction, right or left; the sliding rings on pipe side bars, shown in photograph, permit the canvas cover to assume the same turning or indicated direction. Canvas sleeves are slipped over ends of pipe handles to prevent frosting of the hands of stretcher-bearers in winter.

Fig. 2 shows a side or lateral viewpoint and construction detail of the litter when the latter is unlocked in the manner described, it being noted that the stretcher has assumed the form somewhat like the letter "S." The litter is very strong and simple in its construction to withstand rough usage, and is of approximately the same weight as the straight or rigid regulation litter in use in the United States Army.

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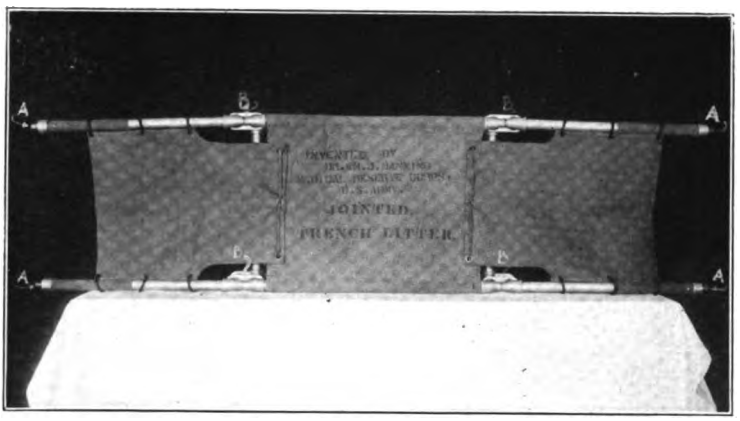

FIG. 1.—THE MANNING TRENCH LITTER, LOCKED

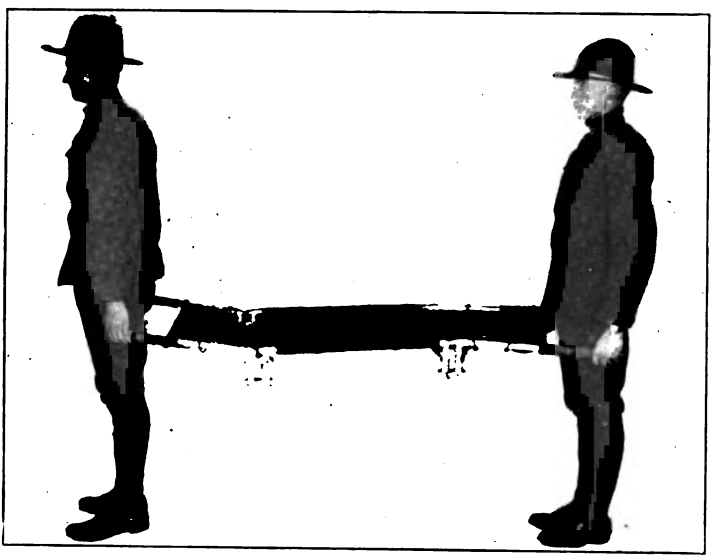

FIG. 2.—THE MANNING TRENCH LITTER, UNLOCKED

(To face page 250.)

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ORIGINAL ARTICLES

Authors alone are responsible for the opinions expressed in their contributions

THE COMMUNICABLE DISEASES IN THE NATIONAL GUARD AND NATIONAL ARMY OF THE UNITED STATES DURING THE SIX MONTHS FROM SEPTEMBER 29, 1917, TO MARCH 29, 1918[1]

BY COLONEL VICTOR C. VAUGHAN, M. C., AND CAPTAIN GEORGE T. PALMER, S. C., U. S. ARMY

(With thirty-five charts)

INTRODUCTION

THE purpose of this report is to take stock of health matters in our armies, to study the data furnished in weekly telegraphic reports, to review the records of sanitary inspectors and epidemiologists, to ascertain what diseases have appeared in the armies and the extent of their spread, and to investigate the avenues through which these infections have found their way into the camps. The mobilization of raw, untrained men and their hurried transformation into effective soldiers have always been accompanied by marked increase in morbidity and mortality. The assembly of young men in camps acts like a drag-net bringing to a central point all infections prevalent in the area from which these men come. The wider the area, the larger the numbers of those brought together, the greater the susceptibility of the individuals constituting the assembly, the more closely these individuals are crowded together and the more intimate their contact, the larger the number of bearers of the infections, the more virulent the disease-causing organisms brought into the camps, the greater will be the morbidity and mortality from communicable diseases. Our Government has assembled within less than one year more than one million untrained, undisciplined men, most of whom were quite ignorant of personal hygiene and without previous experience in caring for them-

[1] A Report from the Section of Communicable Diseases, Division of Sanitation, under the direction of Col. Dean C. Howard, published by permission of the Surgeon General.

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selves under conditions of army life. That the morbidity and mortality from communicable diseases among these should show an average above the figures shown in the civilian life from which they came was to be expected by one familiar with the science of epidemiology.

We have chosen to cover the time from September 29, 1917, to March 29, 1918, because the camps were fairly well developed on the first of these dates, the period covers the winter months, and our findings can be compared with the summer months, when there will be felt the seasonal influence on the character and spread of infections. Furthermore, lessons learned from these studies may give information which possibly may be utilized with great advantage next winter.

This report covers and is confined to the period of time mentioned, and any conclusions that are drawn may be considered tentative, founded upon the evidence so far secured, and subject to such modification as may be justified by additional information.

The data which follow deal for the most part with thirteen National Guard camps and sixteen National Army cantonments, including over 70 per cent of the troops in this country during the period in question. Records from small and scattered units and from the various posts of the Regular Army are omitted, as the data from these places are less readily subjected to statistical analysis. All of these facts will, of course, be included in later reports. The data from four large Guard camps which were in existence in October are omitted because the men were shifted elsewhere shortly afterwards. The present report thus deals with camps which were in existence continuously throughout the six months.

COMPARATIVE MORTALITY IN ARMY AND CIVIL LIFE

In studying this phase of our problem there are several facts which must be considered. Some of the more important of these are as follows:

The death rate in the Army should be compared with that for the same age period in civil life. The comparison should be made on the records for the same time of the year and, so far as possible, for the same year. Through the courtesy of the health and vital statistics departments of certain states and cities we are able to do this. The greater number of enlisted men in the army are between 21 and 31 years of age. The period nearest this available in civil statistics is the age from 20 to 29 years. In all comparisons between

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military and civilian death rates the following should be borne in mind:

(*a*) The death rate of the group 20 to 29 years is lower than that of the present draft age, 21 to 31 years.

(*b*) The death rate in these age groups is greater among males than among females.

(*c*) The army includes more above than below the draft age. In all these respects a comparison is slightly to the disadvantage of the army.

The figures for this comparison are expressed as annual rates calculated on actual deaths occurring during the period.

TABLE I.—*Annual Death Rate per* 1,000[2]

(Age 20 to 29 years. Time, October, November, December, 1917; January, February, March, 1918)

Place	*Death rate*
Army	9.1
New York City	5.5
Saint Louis	5.5
New Orleans	10.4
Pittsburgh	6.2
Chicago	5.2

It is seen from these figures that the average death rate for the whole army is higher than that of any city in the list with the exception of New Orleans.

The distribution of death rates by age groups in the Registration Area[3] of the United States, during the winter months of 1915, is shown by the census of that year in Table II, in comparison with the army rate during corresponding months of 1917-1918:

TABLE II

Place	*Death rate per* 1,000
Army	9.1
U. S. Registration Area:	
All ages	14.3
Age, 20 to 49	8.3
Age, 20 to 39	6.8
Age, 20 to 29	5.7

[2] To obtain this information, requests were sent the Commissioner of Health of all States and a number of cities within the Registration Area. It is on the replies received that the civil statistics of the past winter are based. There are instances of wide variation in the rates of certain diseases. The accuracy of some of these may be questioned. Errors may have been caused by improper reporting or else by erroneous population figures used in the computation of rates. Populations have been estimated in the customary manner followed by the Census Bureau, which assumes increases in arithmetical progression. This is open to error because the present is the eighth year since the last census of 1910—and we do not know that populations in all cases have increased in this manner.

[3] The Registration Area in 1915 includes 25 States, the District of Columbia, and 41 cities in non-registration States. Included among the registration States is North Carolina, the returns from which relate only to municipalities having 1,000 or more inhabitants in 1910. The States and cities making up this area are those for which the registration of deaths has been accepted as being approximately complete (at least 90 per cent of all deaths being registered), and which were admitted to the Registration Area only after it was known from the data at hand that the deaths were being recorded properly under the state law or, for cities, under municipal ordinance.

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These figures show that, while the older age groups have the higher rates, all below 49 are lower than the Army. It must be borne in mind, however, that the Registration Area covers a wide diversity in density of population, while the closeness of contact in the camps is greater and more continuous than that of the most crowded city. Furthermore, the Registration Area does not include the states of South Carolina, Georgia, Florida, Tennessee, Alabama, Mississippi, Louisiana, Oklahoma and Texas, where death rates are higher. As will be seen in the table following, which gives the rates for each camp, there are 13 camps out of 29 with rates below the rate for age group 20 to 29 in the Registration Area. It may be pointed out also that, while some deaths may escape report in civil life, all in the camps are reported.

It is a striking fact that the death rates in the different camps show wide variation as is indicated in Table III.

TABLE III.—*Annual Death Rates per* 1,000

(See Chart I)

National Guard		*National Army*	
Wheeler	28.3	Pike	30.7
Beauregard	25.4	Jackson	19.9
Bowie	23.1	Funston	16.3
Sevier	15.5	Travis	15.3
Cody	12.7	Lee	10.8
Doniphan	11.9	Dodge	9.1
Shelby	8.6	Taylor	9.0
Kearney	8.1	Gordon	7.8
Sheridan	2.8	Sherman	5.4
Hancock	2.6	Upton	5.3
Wadsworth	2.5	Custer	5.1
McClellan	2.4	Lewis	4.1
Logan	2.3	Meade	3.9
		Grant	3.8
		Devens	3.7
		Dix	2.9

It will be seen by comparing Table III with Table I that five National Guard camps (Sheridan, Hancock, Wadsworth, McClellan and Logan) have shown lower death rates than New York City, St. Louis, New Orleans, Pittsburgh and Chicago for the age group 20 to 29 years. Two more National Guard camps (Shelby and Kearney) show lower death rates than New Orleans for this age group. Six National Army camps (Custer, Lewis, Meade, Grant, Devens and Dix) show lower death rates than any of the above-mentioned cities. Two other National Army camps (Sherman and Upton) are about on a level with New York, St. Louis and Chicago, and below Pittsburgh and New Orleans. Three more National Army

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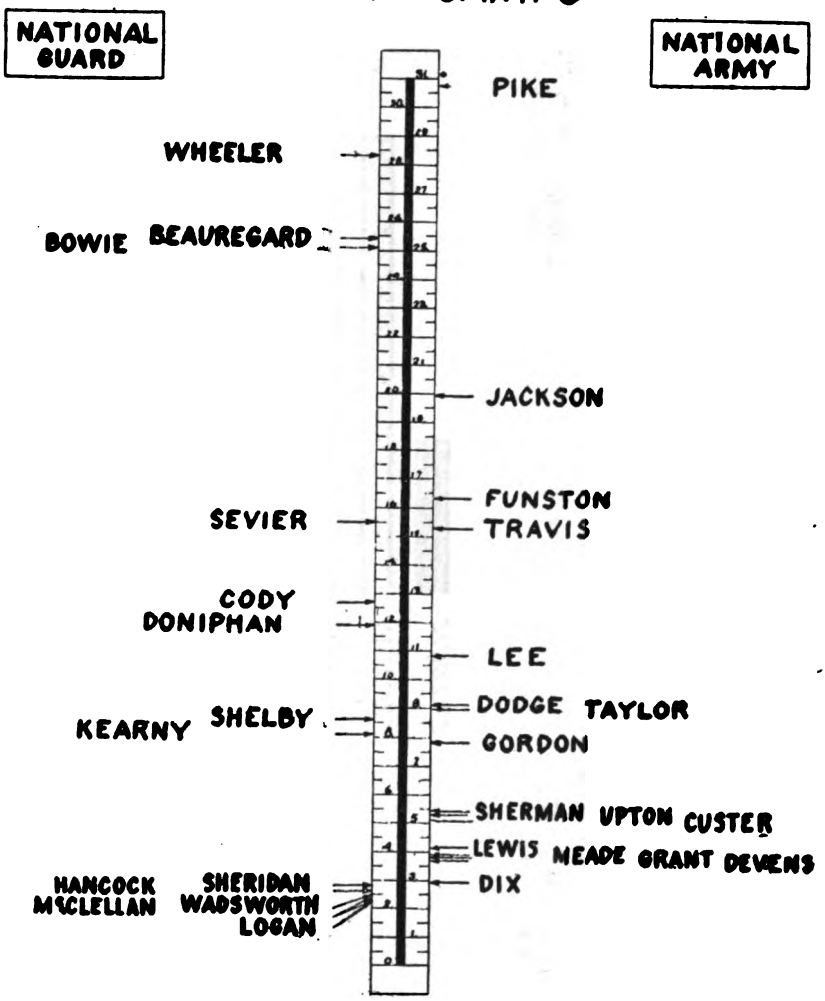
DEATHS FROM ALL CAUSES IN ARMY CAMPS



ANNUAL DEATH RATE PER 1000
SEPT. 29, 1917 TO MAR. 29, 1918

CHART I

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camps (Dodge, Taylor and Gordon) are below New Orleans. These facts demonstrate that camp life may be made as safe as that of some of our best health-guarded cities and indeed may show a lower

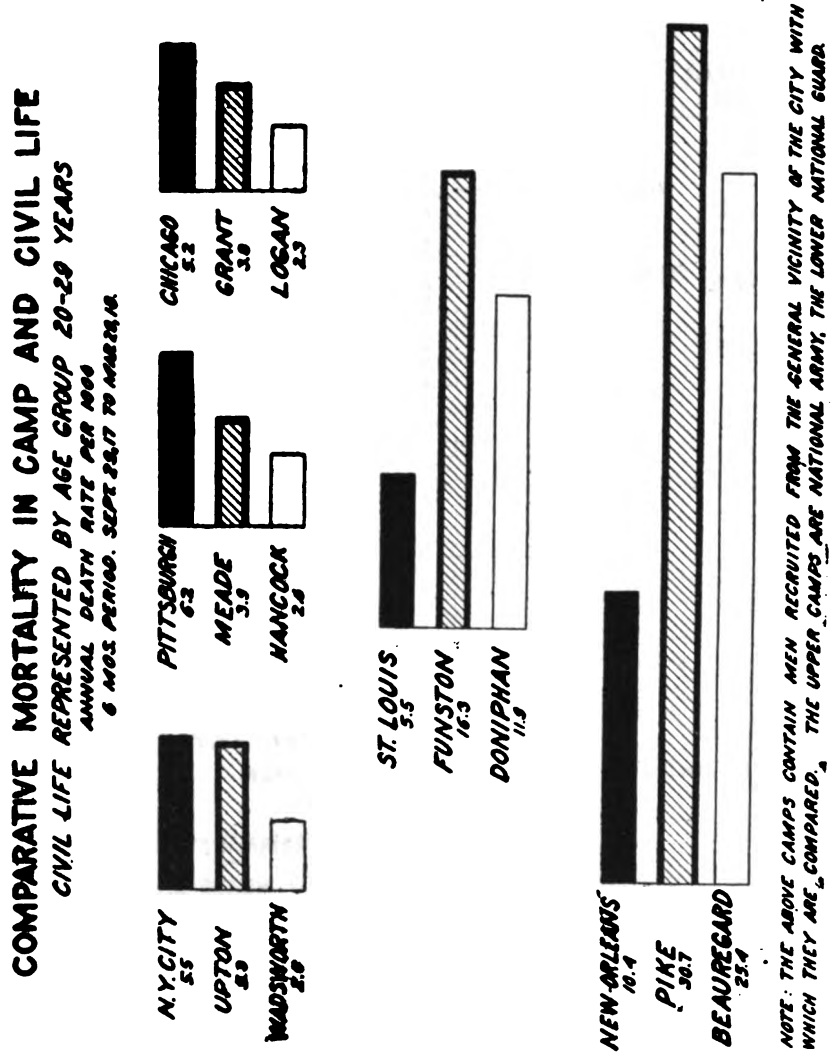
COMPARATIVE MORTALITY IN CAMP AND CIVIL LIFE
CIVIL LIFE REPRESENTED BY AGE GROUP 20-29 YEARS
ANNUAL DEATH RATE PER 1000
6 MOS PERIOD. SEPT 28/17 TO MAR 31/18.
N.Y.CITY 5.5
UPTON 4.9
WADSWORTH 2.6
PITTSBURGH 6.2
MEADE 3.9
HANCOCK 2.6
CHICAGO 5.2
GRANT 3.8
LOGAN 2.3
ST. LOUIS 5.5
FUNSTON 16.3
DONIPHAN 11.9
NEW ORLEANS 10.4
PIKE 30.7
BEAUREGARD 25.4
NOTE: THE ABOVE CAMPS CONTAIN MEN RECRUITED FROM THE GENERAL VICINITY OF THE CITY WITH WHICH THEY ARE COMPARED. THE UPPER CAMPS ARE NATIONAL ARMY; THE LOWER NATIONAL GUARD.

CHART II

death rate in the corresponding age group. It is worthy of note that Camps Wadsworth and Upton, both made up largely of New York troops, compare favorably with New York City; that Hancock, composed of the Pennsylvania National Guard, is better than Pitts-

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burgh; that Logan, occupied by the National Guard of Illinois, is better than Chicago; that Doniphan, occupied by the Missouri National Guard, is worse than St. Louis; and that Beauregard, the location of the National Guards of Louisiana, Mississippi and Arkansas, is far worse than New Orleans. Chart II is presented to show comparative death rates in civil life and National Guard and National Army camps.

In Table IV are given the site of the camps and states which furnished troops to each camp.

The question of the wide variations in the death rates in the different camps is a difficult one to answer. There are evidently many factors involved, some of which will be briefly discussed.

(*a*) Some of the camps have acted as filters through which many troops have passed, leaving their most unfit on the filter. To figure the average strength of these camps as a basis for the computation of their death rate is hardly fair, but we know of no other way to do this. It is a striking thing that the worst camps as measured by their death rates are bad when measured by sick admissions, non-effective rate, and prevalence of each of the most important communicable disease, including venereal disease, the last of which is certainly not influenced by weather, housing, clothing, camp sanitation, medical or health supervision of the camp. This is graphically shown by Chart III. In a general way it can be stated that those camps which may be designated as closed camps and which have been least employed as filters are the healthiest camps. However, there are exceptions to this.

These filter camps may suffer, so far as morbidity and mortality rates are concerned, in two ways. First, the camps from which troops have come may have selected the least desirable men for transfer. There are reasons for suspecting that this has been done. In this way the filter camp suffers on account of the inferiority of the material received. In the second place, when the troops pass on to another camp many of the unfit may be left behind. Funston and Pike have been notable filter camps as thus explained.

Wadsworth may be taken as an example of a closed camp. Practically no new troops reached this camp during the period covered by this report. In fact the first accession came in March and consisted of 1,500 select men from Camp Taylor. These men had been in service but a short time and were from the mountains of Kentucky and Tennessee. They came with, and continued to develop, pneumonia, meningitis and minor diseases and soon had a non-

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TABLE IV.—*Location of National Guard and National Army Camps, Together with the States from Which the Men are Drawn. October, 1917, to March, 1918*

National Guard

Camp	Site	Source of troops
Beauregard	Alexandria, La	Arkansas, Louisiana, Mississippi.
Bowie	Ft. Worth, Texas	Oklahoma, Texas.
Cody	Deming, N. M.	Iowa, Minnesota, Nebraska, South Dakota.
Doniphan	Ft. Sill, Okla.	Kansas, Missouri.
Hancock	Augusta, Ga.	Pennsylvania.
Kearney	Linda Vista, Cal.	Arizona, California, Colorado, New Mexico, Utah.
Logan	Houston, Texas	Illinois.
McClellan	Anniston, Alabama	Delaware, District of Columbia, Maryland, New Jersey, Virginia.
Sevier	Greenville, S. C.	North Carolina, South Carolina, Tennessee.
Shelby	Hattiesburg, Miss.	Indiana, Kentucky, West Virginia.
Sheridan	Montgomery, Ala.	Ohio.
Wadsworth	Spartanburg, S. C.	New York.
Wheeler	Macon, Georgia	Alabama, Florida, Georgia.

National Army

Custer	Battle Creek, Mich.	Michigan, Wisconsin.
Devens	Ayer, Mass.	Maine, New Hampshire, Vermont, Massachusettes, Rhode Island, Connecticut, New York.
Dix	Wrightstown, N. J.	Delaware, New Jersey, New York.
Dodge	Des Moines, Iowa	Illinois, Iowa, Minnesota, North Dakota.
Funston	Ft. Riley, Kansas	Arizona, Colorado, Kansas, Missouri, Nebraska, New Mexico, South Dakota.
Gordon[4]	Atlanta, Ga.	Alabama, Georgia, Tennessee.
Grant	Rockford, Ill.	Illinois, Wisconsin.
Jackson	Columbia, S. C.	Florida, North Carolina, South Carolina.
Lee	Petersburg, Va.	Pennsylvania, Virginia, West Virginia.
Lewis	American Lake, Wash.	Alaska, California, Idaho, Montana, Nevada, Oregon, Utah, Washington, Wyoming.
Meade	Annapolis Junction, Md.	District of Columbia, Maryland, Pennsylvania.
Pike	Little Rock, Ark.	Alabama, Arkansas, Louisiana, Mississippi.
Sherman	Chillicothe, Ohio	Ohio.
Taylor	Louisville, Ky.	Illinois, Indiana, Kentucky.
Travis	Ft. Sam Houston, Tex.	Oklahoma, Texas.
Upton	Yaphank, L. I., N. Y.	New York.

NOTE: The States indicated represent the chief source of troops at each place. There are small increments from other points in a number of camps.

[4] This camp was occupied by the troops indicated less than two months, when these troops were sent to Wheeler and replaced at Gordon by draft men from many states.

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effective rate of 79 per 1,000 as compared with 24 for the 27th Division. Before this accession the 27th Division consisted wholly of the N. Y. National Guard and the men came from the larger cities of that state with but few from rural communities.

It is a frequent observation in the reports of the health of organizations that all accessions of unseasoned men are followed by a rise in the mobidity curve of "all diseases," and especially of the acute respiratory diseases.[5] On the other hand it seems true that variations in the morbidity curve are less apparent in the more stable organizations. Furthermore, it is frequently stated that the type of an existing disease changes simultaneously with the accession. Lobar pneumonia was the prevalent form of this disease at Grant until troops from Jefferson Barracks arrived, after which bronchopneumonia with streptococcus infection became the predominant type. Fatigue from a long journey by rail may have some effect in lowering resistance, though possibly overcrowding in trains may be a greater factor.

(*b*) We have tried to ascertain the influence of race, nationality, section of the country from which the troops have come and other similar circumstances on the morbidity and mortality of the several camps, but the data that we have obtained on these points do not justify us in speaking other than tentatively concerning these matters. However, the following points seem to be fairly clear. Under similar conditions the negro is more susceptible to the acute respiratory disease than the northern white man. The death rate from pneumonia among the negro troops at Camp Dodge as compared to that among the whites has been as 4.4 is to 1. It will be interesting to note whether this holds true during the warmer months. Southern whites are more susceptible to this disease than are northern whites. These observations are in accord with those of other observers both in this country and abroad. The elder Flint, who practised medicine both in the North and in the South, made statements to this effect many years ago. The French have found their African troops especially susceptible to pneumonia and have been compelled to provide warmer quarters and heavier clothing for them in the winter than are necessary for the native French soldier. General Gorgas had abundant opportunity to study pneumonia on the Canal Zone and in South Africa, and before the assembly of our troops began, he predicted that the acute respira-

[5] The designation "respiratory diseases" is used throughout this paper in referring to those diseases which are transmitted through the respiratory organs.

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COMPARATIVE MORTALITY AND MORBIDITY AT NATIONAL GUARD AND NATIONAL ARMY CAMPS FOR 6 MONTHS PERIOD SEPT. 25, '17 – MAR. 25, '18.

Plotted on basis of 100 for highest rate in each cause.

Order of Columns.

1. Deaths All Causes. 2. Admissions. 3. Deaths from Tb. 4. Deaths from Diphtheria. Morbidity from – 5. Pneumonia. 6. Measles. 7. Meningitis. 8. Scarlet Fever. 9. Typhoid and Paratyphoid. 10. Malaria. 11. Venereal Disease.

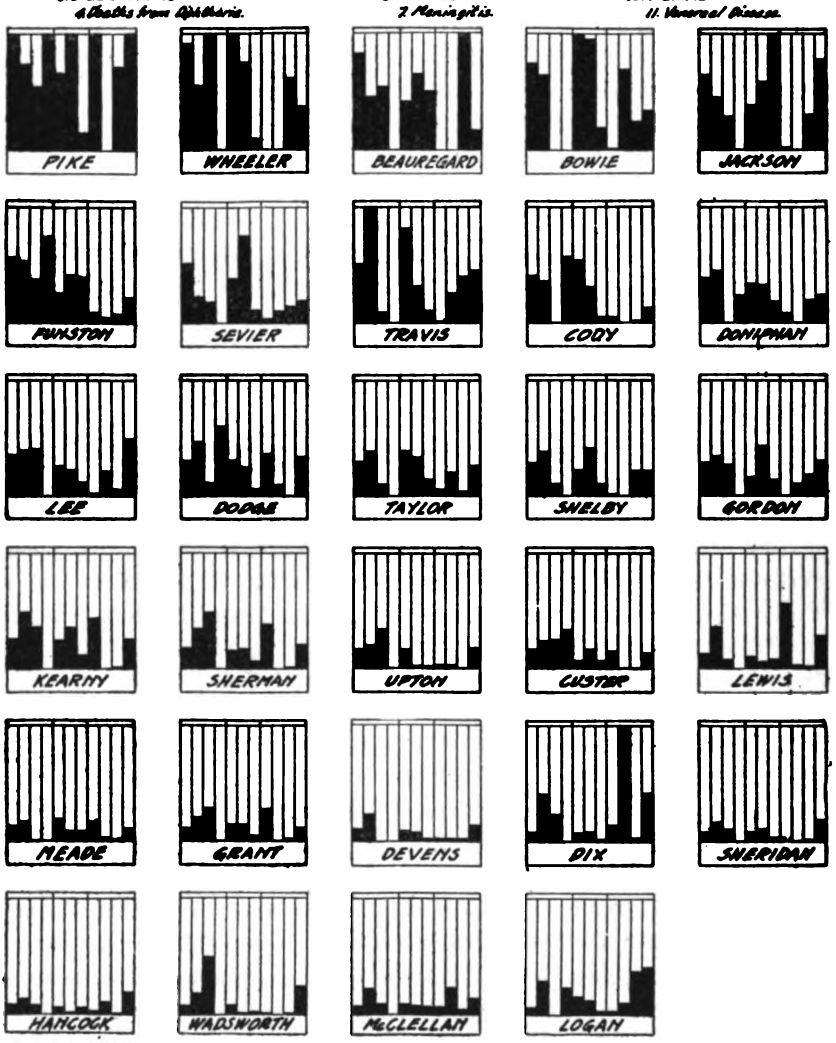

CHART III

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tory diseases, and especially pneumonia, would be among the most prevalent diseases.

It is an opinion generally held by medical officers in southern camps that hookworm disease and chronic malarial infection increase susceptibility to the acute respiratory diseases. The information we have on these points is not as full as could be desired. There has been a careful examination of the feces in the 36th Division at Bowie, with the following results:

Total strength	25,224	
Number examined	23,659	
Positive hookworm	2,921 =	(12.3%)
Tapeworm	480 =	(2%)
Miscellaneous parasites	24	

(*c*) There is no reason for believing that either morbidity or mortality in any camp has been due to faulty sanitation, as we usually understand this term. All the camps are kept clean, have unquestioned water supplies, satisfactory garbage and sewage removal, etc.

The unsanitary camp of 1898, as seen at Chickamauga and in other encampments of that time, does not exist in the United States today. There undoubtedly has been some faulty handling of the communicable diseases. In certain camps, sick men have been allowed to remain in quarters too long for their own good and for the protection of their comrades from infection. There have been mistakes in diagnosis which have favored the spread of infection. In some camps there has been no attempt to distinguish between the two diseases known under the name of measles, and these have been mingled in the hospitals, with the result that the patient has had both diseases before he was through. The differential diagnosis between measles and scarlet fever has not always been correct, and there has been some mixing of patients in wards devoted to these diseases. Such mistakes occur in private practice, probably with greater frequency, but the consequences are not so serious as they are in the large and crowded army hospitals.

COMPARATIVE DEATH RATES IN NATIONAL GUARD AND NATIONAL ARMY

This comparison cannot be made in a satisfactory manner, because the two services have been mixed. The National Guard has been in tents and the Army for the most part in barracks, but in some of the National Guard camps quite half the troops have been select or drafted men. The comparison is, therefore, largely between

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tent and barrack camps. The additions made to the Regular Army have been in tents. With this understanding, the death rates in the three organizations are as follows (annual rate per 1,000): National Army, 9.6; National Guard, 9.5; Regular Army, 7.8. Comparing the National Army and the Guard, it will appear that the death rates have been practically the same among soldiers in tents and those in barracks. The lower death rate in the new additions to the Regular Army is believed to be due to the fact that the average age of the men is greater than in the other organizations, and it is furthermore probable that many of these men have had previous service in the Regular Army. Some figures have been secured at Wheeler which point most consistently to the conclusion that men with previous military training show less sickness than new men.

We might make comparison between the National Guard of certain states and the National Army from the same states. This is done in the following:

TABLE V.—*Comparative Statistics from National Guard and National Army Camps (Annual Rate per 1,000)*

	Camp and home state of troops					
	New York		Ohio		Illinois	
	N. G. Wadsworth	N. A. Upton	N. G. Sheridan	N. A. Sherman	N. G. Logan	N. A. Grant
Deaths, all causes	2.5	5.3	2.8	5.4	2.3	3.8
Morbidity						
Pneumonia	9.1	15.0	9.3	15.0	16.0	14.0
Meningitis	0.8	0.5	1.0	1.7	0.7	1.3
Measles	7.9	6.3	41	65	51	58
Scarlet fever	0.8	1.5	1.8	17.3	1.0	12.3
Venereal disease	77.6	57.2	59.8	67.0	132	36.4
Admissions, all causes*	14.9	16.0	14.0	28.0	24.3	17.1

*Average weekly rate.

It will be seen from these figures that the death rate in the National Army has, in each case, been higher than in the National Guard. This is probably due to the fact that the National Guard contained more seasoned troops than the National Army. The National Guard divisions represented in this table were all on the Mexican border in 1916, but were to a variable extent recruited before being assembled in 1917.

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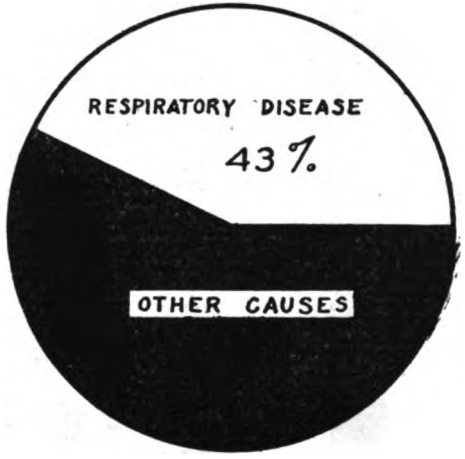
CHART IV

DEATHS FROM RESPIRATORY DISEASE IN CIVILIAN AND ARMY LIFE

INCLUDED IN RESPIRATORY GROUP – PNEUMONIA, MENINGITIS, MEASLES, SCARLET FEVER, DIPHTHERIA, TUBERCULOSIS



CIVILIAN LIFE

U.S. REGISTRATION AREA. 6 WINTER MOS. 1915. AGE 20 TO 29 YEARS INCL.

ALL TROOPS IN U.S.

6 MOS. SEPT. 29, 1917 TO MAR. 28, 1918.

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CAUSES OF DEATH IN THE ARMY

The diseases which have been responsible for the greatest number of deaths in the Army during the period covered by this report are the acute respiratory diseases. These may be named in the order in which they have proved fatal, as follows: Pneumonia, meningitis, measles, scarlet fever and diphtheria. With the addition of tuberculosis, these have caused 78 per cent of all deaths.

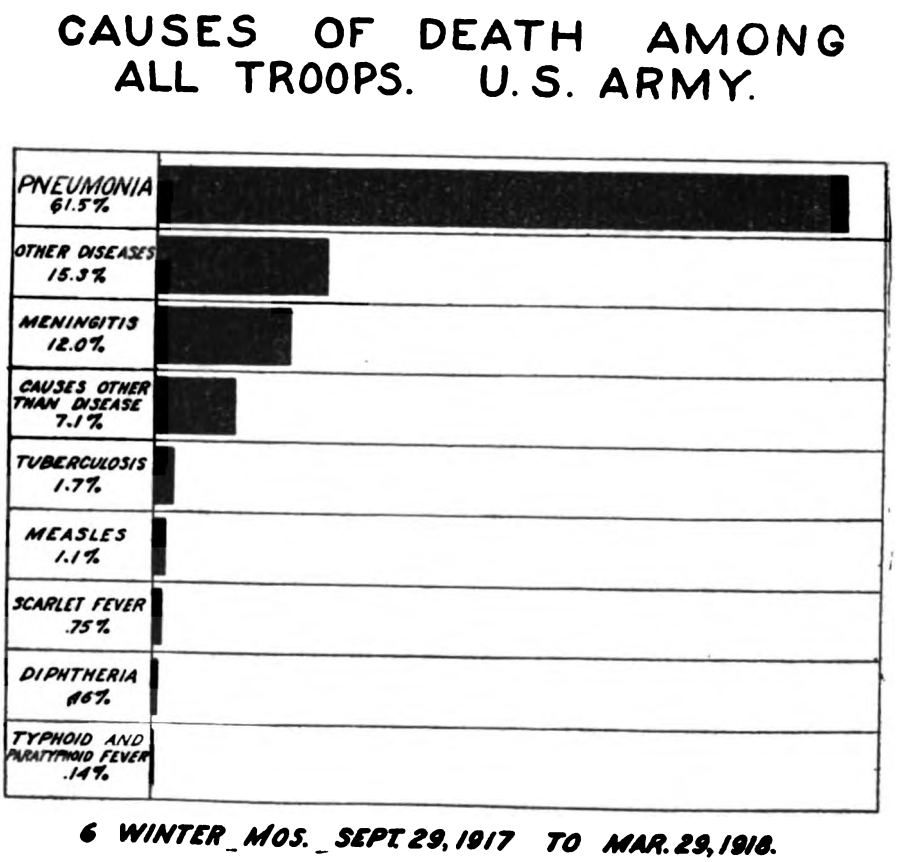
CAUSES OF DEATH AMONG ALL TROOPS. U.S. ARMY.
PNEUMONIA 61.5%
OTHER DISEASES 15.3%
MENINGITIS 12.0%
CAUSES OTHER THAN DISEASE 7.1%
TUBERCULOSIS 1.7%
MEASLES 1.1%
SCARLET FEVER .75%
DIPHTHERIA .46%
TYPHOID AND PARATYPHOID FEVER .14%
6 WINTER MOS. SEPT. 29, 1917 TO MAR. 29, 1918.

CHART V

Fifteen per cent of deaths have been due to other diseases, and 7 per cent due to causes other than disease, such as mechanical injuries. (See Chart IV.)

The percentages of total deaths due to each of the more important causes are shown in Table VI.

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TABLE VI.—*Causes of Death in the Army (all Troops in the U. S.) in Six Winter Months*

Cause	*Per cent of total deaths*
Pneumonia	61.5
Other diseases than here mentioned	15.3
Meningitis (all kinds)	12.0
External causes	7.1
Tuberculosis	1.7
Measles	1.1
Scarlet fever	0.75
Diphtheria	0.46
Typhoid fever	0.14

See Chart V.

The acute respiratory diseases have caused an excessive death rate in the Army compared with that due to the same causes in civil life. For the age group from 20 to 29 years, in the Registration Area in the United States for the five years, 1911 to 1915, deaths from the respiratory diseases, including tuberculosis, amounted to 43 per cent of total deaths.

Pneumonia has caused by far the greatest number of deaths in the Army, and has been responsible for about 80 per cent of total deaths caused by the above respiratory diseases. Comparative figures for army and civil life (for the age period 20 to 29 years) for deaths due to respiratory diseases are given in Table VII.

TABLE VII.—*Annual Death Rate per* 100,000

	Pneumonia all forms	Meningitis	Measles	Scarlet fever	Diphtheria	Tuberculosis, all forms
Army	559	109	9.4	6.9	4.2	15.3
U. S. Reg. Area	46	2.4	0.5	1.1	1.8	197
Massachusetts	41	2.3	0.3	1.7	1.4	177
Virginia	111	9.1	2.1	0.5	1.1	602

This table indicates that each respiratory disease, except tuberculosis, has caused an excessive fatality in army life. Assuming the conditions in the Registration Area for 1915 to be fairly representative of other years, we may express the relative fatality between civilian and army life during the six winter months as follows:

Pneumonia is 12 times greater in the Army.
Meningitis is 45 times greater in the Army.
Measles is 19 times greater in the Army.
Scarlet fever is 6 times greater in the Army
Diphtheria is 2 times greater in the Army.
Tuberculosis is 13 times greater in civil life.

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It is evident that the low tuberculosis death rate in the Army is due to the elimination of those with active forms of this disease. Furthermore, it is probable that most of the deaths from tuberculosis in the Army have been due to the activation of inactive foci by acute respiratory diseases.

It is known that the winter covered by this report in the region east of the Rocky Mountains has been one of unusual severity, and we might think that this has been partially responsible for the excessive rates in the army camps. A perusal of the figures, however, does not justify this speculation. For instance, in the following table there are given the death rates for pneumonia and meningitis during the past winter from those states from which we have been able to secure data.

TABLE VIII.—*Annual Death Rates per* 100,000 *During Six Winter Months* (1915 *January, February, March, October, November, December*)

[Instances where disease during past year exceeds that of 1915 are in bold-faced figures.]

Place	Pneumonia		Meningitis	
	1915	1917–1918	1915	1917–1918
Vermont	133	102	6.1	0
Massachusetts	199	104	7.9	4.2
Rhode Island	202	133	6.6	6.3
Connecticut	190	**220**	10.3	3.8
New York City	227	**265**	4.7	4.3
Indiana	161	148	7.4	**11.0**
Michigan	134	**152**	9.7	9.6
Wisconsin	142	120	6.8	**11.4**
Minnesota	122	86	6.0	1.7
Kansas	133	**143**	4.1	**17.3**
Colorado	218	185	9.2	**12.4**
Montana	171	**199**	5.8	**20.0**
Virginia	161	158	11.0	**15.7**
Kentucky	141	**169**	13.5	**22.0**

Contrasted with the figures for the past winter are the rates for 1915. It will be seen that, while the rates have been excessive in some states, this is by no means common to all states. Thus the pneumonia rates during the past winter have been higher than they were three years ago in Connecticut, New York City, Michigan, Kansas, Montana and Kentucky. Pneumonia rates have been lower this year than in 1915 in Vermont, Massachusetts, Rhode Island, Indiana, Wisconsin, Minnesota, Colorado and Virginia. Of the

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fourteen places mentioned seven have had higher meningitis rates in the past winter, whereas the other seven have had lower. It is not evident, therefore, that the severity of the past winter has produced a general bad effect on the pneumonia and meningitis incidence.

SICKNESS IN THE ARMY

While pneumonia and meningitis have exacted the greatest toll in life, they have not been as important a factor in incapacitating troops as some other causes. Measles is a big factor in this connection. The annual morbidity rate for measles for all troops in this country during the six-month period was 105 per thousand. The rate for pneumonia was 24.2, that for meningitis 4.1. Pneumonia and meningitis are the more fatal diseases, and therefore, although fewer cases occur, the number of deaths is great. The fatality rate, or case mortality rate, for all troops during the six-month period has been 23 per cent for pneumonia, 27 per cent for meningitis, and 0.1 per cent for measles.

Most numerous as causes of sickness are those minor ailments such as colds, influenza, bronchitis, and mumps. Of the total number admitted to hospital or quarters, relatively few are caused by the more serious ailments. Considering the National Guard and the National Army camps as a whole, we find that 95.2 per cent of admissions for sickness are due to disease of one form or another. Of the more serious infectious diseases, measles stands foremost, followed by venereal disease. The relative incidence of the different diseases is shown in the following table:

TABLE IX.—*National Guard and National Army Camps (Six-months period, September 29, 1917, to March 29, 1918). Cause of Admission to Hospital or Quarters*

		Per cent
Causes other than disease[6]		4.8
Measles	7.3	
Venereal disease	5.8	
Pneumonia	1.8	
Scarlet fever	.42	
Meningitis	.21	
Malaria	.18	
Typhoid and paratyphoid	.019	
Diseases other than the above[7]	79.5	
Total disease		95.2

(See Chart VI)

The relative incidence of these various diseases in the different army groups is shown in the following table, where the morbidity from each cause has been expressed as an annual rate per 1,000.

[6] Under this heading are included injuries, sunstroke, sprained ankles, gunshot wounds, etc.
[7] This large group includes the minor and rare diseases such as colds, la grippe, mumps, whooping cough, bronchitis, influenza, pharyngitis, laryngitis, tonsillitis, chickenpox, smallpox, anthrax, tetanus, etc.

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CAUSES OF ADMISSION TO HOSPITAL AND QUARTERS

29 NATIONAL GUARD AND NATIONAL ARMY CAMPS

6 MONTHS PERIOD. SEPT. 29, 1917 TO MAR. 29, 1918

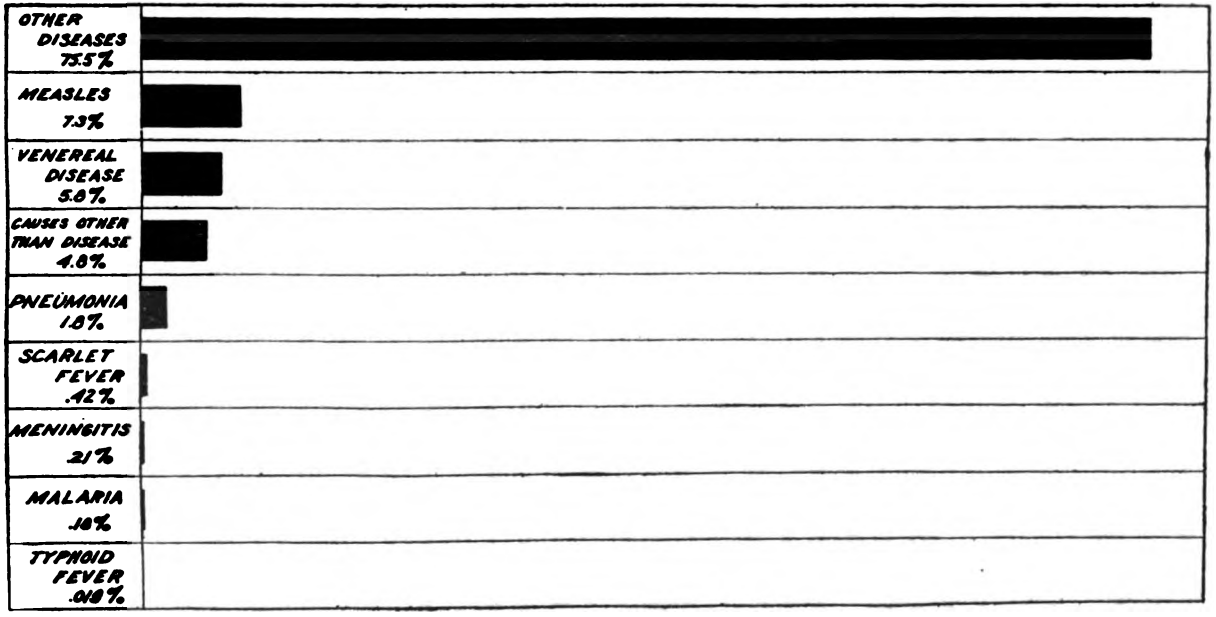

CHART VI

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TABLE X.—*Annual Morbidity Rate per* 1,000 (*Six-months Period, September* 29, 1917, *to March* 29, 1918)

	Measles	Venereal disease	Pneumonia	Scarlet fever	Meningitis	Malaria	Typhoid and paratyphoid
Regular Army.....	57.0	77.2	17.6	9.9	1.9	1.3	0.14
National Guard....	132.0	75.4	31.8	3.0	2.8	3.6	0.35
National Army....	100.0	103.0	25.2	9.4	3.6	2.1	0.24

NOTE.—Data from 13 National Guard and 16 National Army Camps.

The National Army, with its new recruits from civilian life, shows the highest rate in venereal diseases and meningitis. National Guard troops, however, show the highest rates for measles, pneumonia, malaria and typhoid. Regular Army troops, representing those longest in the service and in all probability an older average age, show the lowest rates in everything but scarlet fever and venereal disease, the latter being slightly above the rate for the Guard.

EPIDEMIC DISEASES IN NATIONAL GUARD AND NATIONAL ARMY CAMPS

Measles, pneumonia, meningitis and scarlet fever have existed in a number of the camps. Measles has been by far the most prevalent of the four. Scarlet fever has been of minor consequence. Typhoid fever has been a negligible factor as a cause of incapacitation. Mumps, bronchitis and influenza have likewise been widespread and, although not fatal in themselves, have frequently been forerunners of pneumonia.

Pneumonia

As pointed out elsewhere in this paper, pneumonia has been of more serious import than any other single disease. It has occurred in epidemic form in many camps, particularly in those occupied by southern troops. In other camps, especially those occupied by the troops from the middle western and northern states, pneumonia has been sporadic rather than epidemic. Among the troops from the northeastern section of the country pneumonia has been less prevalent.

In Table XI are presented the mortality and morbidity rates for pneumonia in the various National Guard and National Army camps.

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TABLE XI.—*Sickness and Deaths from Pneumonia in Army Camps (Six-months Period, September 29, 1917, to March 29, 1918). Annual Rate Per 1,000*

Camp	Army	Morbidity rate	Death rate	Camp	Army	Morbidity rate	Death rate
Bowie	N. G.	96	20.0	Meade	N. A.	18	2.6
Wheeler	N. A.	95	23.6	Logan	N. G.	16	1.0
Travis	N. A.	78	10.6	Gordon	N. A.	15	5.3
Pike	N. A.	63	24.9	Sherman	N. A.	15	2.5
Cody	N. G.	52	9.7	Upton	N. A.	15	3.6
Beauregard	N. G.	42	15.0	Grant	N. A.	14	1.5
Taylor	N. A.	37	5.4	Lewis	N. A.	11	1.5
Sevier	N. G.	36	11.5	Devens	N. A.	9.8	2.0
Jackson	N. A.	36	10.7	McClellan	N. G.	9.6	1.1
Doniphan	N. G.	33	9.0	Sheridan	N. G.	9.3	1.7
Dodge	N. A.	29	5.3	Wadsworth	N. G.	8.8	1.1
Funston	N. A.	24	10.5	Dix	N. A.	8.0	1.5
Kearny	N. G.	24	4.4	Custer	N. A.	7.0	1.5
Lee	N. A.	24	5.5	Hancock	N. G.	6.7	1.1
Shelby	N. G.	21	4.7				

NOTE.—Chart VII shows the morbidity from pneumonia by camps.

The highest pneumonia morbidity rates are at Bowie and Wheeler. These camps, along with Pike, show by far the highest death rates from this cause. The excessive prevalence of this disease is appreciated on comparing the death rate at Pike with that for Logan, the lowest in the table. The rate at Pike is twenty-five times that at Logan.

As compared with civil life, pneumonia has been unduly prevalent in the camps during the past winter. The average pneumonia rate for all camps is high, because of excessive rates at certain of the southern troop camps. The lowest camp rates are not higher than the rates for civilian life. The rate for the New York National Guard troops at Wadsworth, for instance, is 1.1, while the rate for the age group 20 to 29 years in New York City for the six winter months was 1.0. The rate for National Guard troops from Pennsylvania at Camp Hancock is 1.1, as compared with a rate of 1.8 for the age group 20 to 29 years for the city of Pittsburgh from October 1, 1917, to April 1, 1918. Nearly twice as many deaths occurred among Pittsburgh as among other Pennsylvania men in Camp Hancock.

In New York City during the past winter the pneumonia rate for all ages was 2.65; for age group 20 to 29 it was 1.00. The proportion for the specific age group is thus 38 per cent. In Table XII there are included pneumonia death rates for the past winter for a number of states. By applying the factor obtained in New York City to the death rates at all ages in other states, we may secure a rough approximation of the death rates in age group 20 to 29 years.

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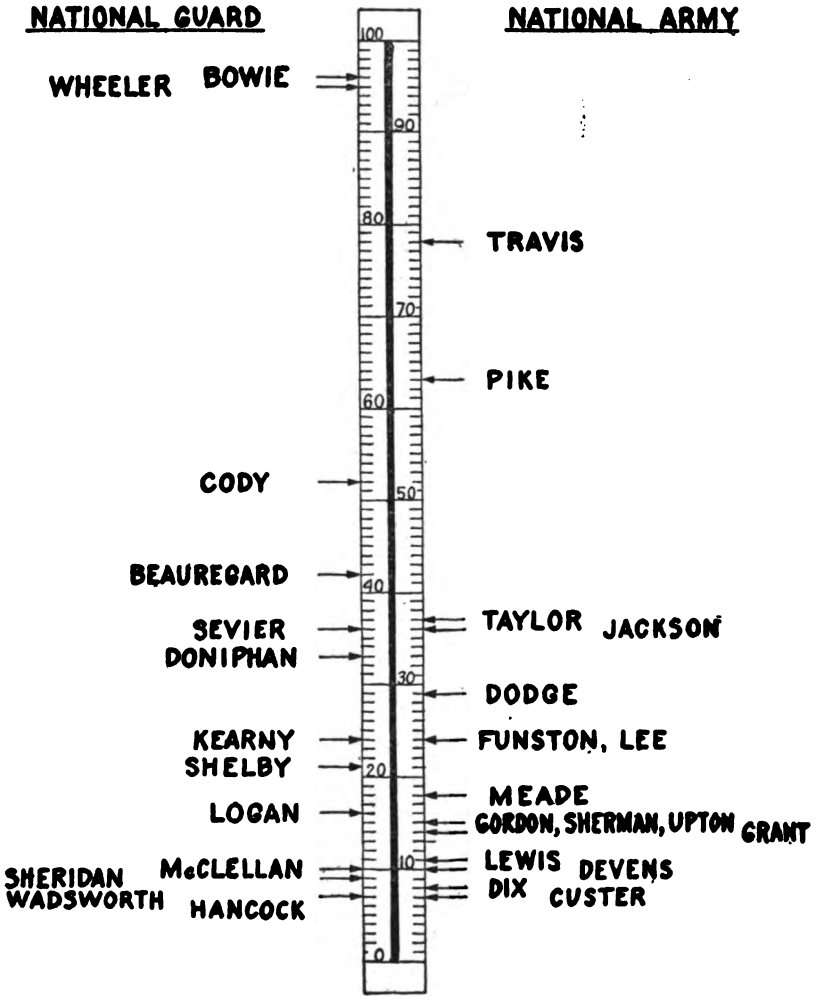
PNEUMONIA IN ARMY CAMPS



ANNUAL MORBIDITY RATE PER 1000
SEPT. 29, 1917 TO MAR. 29, 1918.

CHART VII

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TABLE XII.—*Pneumonia Death Rates in Civilian Life. Annual Rate per* 1,000. *Period, Winter of* 1917–1918

	Months	Rate (all ages)	Rate (age 20–29 years)
Vermont	October, November, December...	1.00	0.38
Delaware	October to March, inclusive.....	7.30[a]	2.8
Virginia	October, November, December, January.	1.60	0.61
Connecticut	October to March, inclusive.....	2.20	0.84
Massachusetts	October to February, inclusive...	1.04	0.40
Colorado	October to March, inclusive.....	1.85	0.70
Michigan	October to March, inclusive.....	1.52	0.58
St. Louis	October to March, inclusive.....	2.80	1.1

With the data secured in this manner we may strike the comparisons made in Table XIII.

TABLE XIII.—*Comparative Mortality Rates from Pneumonia in Army and Civil Life. Period, October,* 1917, *to April,* 1918

(Figures in annual rates per 1,000)

Civil locality	Pneumonia rate (estimated rate age groups 20–29 years)		Pneumonia rate	Army camp	Source of troops
Vermont	0.38				
Connecticut	0.84	0.54	2.0	Devens	New England States.
Massachusetts	0.40				
Delaware	2.8		1.5	Dix	Delaware, New York, New Jersey.
Virginia	0.61		5.5	Lee	Virginia, West Virginia, Pennsylvania.
Colorado	0.70		10.5	Funston	Colorado, Arizona, Kansas Missouri, Nebraska, New Mexico, South Dakota.
Michigan	0.58		1.5	Custer	Michigan, Wisconsin.
St. Louis, Mo.	1.1		9.0	Doniphan	Missouri.

It is evident from this table that army rates are above those for civilian life. There is an exception in the case of Camp Dix, whose rate is below that of Delaware. Dix is occupied by New Jersey and New York troops, as well as those of Delaware, and the Dix rate is not, therefore, a fair representation for Delaware soldiers. In general, the camp rate for New England is about four times that of civilian life; Camp Lee is about nine times that of Virginia; Funston is fifteen times that of Colorado; Custer is nearly

[a] This is the figure furnished us by the state health authorities.

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three times that of Michigan; Doniphan is eight times that of St. Louis. We may conclude that in general camp life is more conducive to pneumonia than civilian life.

Pneumonia prevailed most extensively during November and December. The weekly pneumonia incidence for the Army as a whole compared to each of the Guard and National Army camps, is pictured in Charts XX and XXXV accompanying this report. The rates which we have used in discussing this question are averages for a period of six months. The epidemic nature of the disease in some camps is suggested by the rates during the weeks when the disease was most prevalent. This is shown in Table XIV.

TABLE XIV.—*Pneumonia Morbidity in Certain Camps. Figures in Terms of Annual Rate Per* 1,000

	PNEUMONIA RATE		
Camp	*Average 6 mos.*	*Highest week*	*Week ending*
Bowie	96	468	December 7
Wheeler	95	340	November 23
Sevier	86	183	November 23
Pike	63	172	November 9

Camp Travis differs from the other camps in having a continuously high pneumonia rate and no exceptionally high peaks. Thus the average rate for the six months was 78, whereas the highest week was 169.

DIFFERENCES IN THE VIRULENCE OF THE INFECTING ORGANISMS CAUSING PNEUMONIA

The figures presented in this paper must forcefully impress one with the following facts:

1. Morbidity and mortality in the camps during the period covered by this report have been largely due to the acute respiratory diseases, especially pneumonia and meningitis, the former being the more potent factor in causing the high death rate.

2. The different camps have shown wide variations in morbidity and mortality from pneumonia.

With these facts in mind, one naturally asks: Has the pneumonia in the different camps been the same disease or does this diagnostic term include two or more diseases, differing etiologically and possibly in other respects? May the wide variations, especially in the mortality rates, be explained by the predominence of one pneumonia in a given camp, while quite another disease under the same name has prevailed at another camp?

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Clinically, pneumonia has been reported as lobar and bronchial. The chiefs of the medical service in the base hospitals are men selected from the best clinicians in the country, and they recognize that a positive, sharp and uniform clinical differentiation between the forms of pneumonia is at present not easy. Accepting the diagnosis as reported, which form of pneumonia has been more prevalent and which more fatal? First, what evidence have we concerning the relative prevalence of these two forms of pneumonia?

TABLE XV

Camp	Period	Total cases	Per cent of lobar
Taylor	October to December	186	62
Pike	October to June	528	67
Cody	October to March	537	93
Wheeler	October to April	775	86
Travis	December	124	77
Travis	April	42	64
Shelby	March to April	61	44

It would appear from Table XV that at all these camps during the months mentioned, with the exception of Shelby, lobar pneumonia predominated. It is reported from some camps that the dominant form of pneumonia changes with the arrival of new troops. Most of the camps, not all, report that broncho-pneumonia has been the more fatal. The case mortality at Pike is reported at 57 per cent in bronchial and 36 per cent in lobar. At Cody the differences showed slightly higher mortality in the lobar form. It is generally agreed that broncho-pneumonia is more frequently a secondary infection, especially after measles.

At Sevier there has been no recognized streptococcus pneumonia. The pneumococcus has been the causative agent in both lobar and bronchial pneumonia and the prevailing organisms has been Type IV.

In this camp a hookworm survey showed 18.6 per cent of the healthy soldiers infected with these parasites. Of total admissions to hospital 20 per cent were infected. Among the broncho-pneumonia cases 50 per cent of those who died had hookworm, while among those who did not have this infection only 17 per cent died.

The base hospital laboratories have been well equipped and manned, and much valuable work has been done in the identification of the bacteria and the differentiation of the types of pneumonia. We are leaving to others a more complete digest of this

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work. In most of the laboratories Type IV has been reported as the predominating organism.

A more important matter is the prevalence of pneumonia in which the streptococcus hemolyticus appears as the causative agent. This coccus is reported as causing both lobar and bronchial pneumonia, and the pneumonia caused by it appears to be more frequently complicated with empyema and more fatal than that due to the pneumococcus.

We are convinced that the differences in morbidity and mortality from pneumonia in the camps are not explained on the ground of variations in kind or virulence of the infecting organisms.

DIFFERENCES IN SUSCEPTIBILITY TO PNEUMONIA OF THE MEN IN DIFFERENT CAMPS AND EXPERIENCES DURING THE CIVIL WAR IN THIS CONNECTION

Our figures show most convincingly:

1. That men from rural communities are more susceptible to pneumonia than are those from urban life.

2. That on the whole the southern soldier is much more susceptible to this disease than his northern comrade.

The fact that pneumonia has been much more prevalent and much more fatal among southern than among northern troops, has led us to look up the history of the acute respiratory diseases during the Civil War. Superficial examination of the "Medical and Surgical History of the War of the Rebellion,"[9] from which the following quotations are taken, shows that the acute respiratory diseases during the Civil War followed the same lines exhibited in our camps during the period covered by this report. We herewith present a brief résumé of the acute resiratory diseases as they appeared in the Civil War. During that war there were reported in the Union Army 67,763 cases of measles, with 4,246 deaths, giving a mortality rate of 6.27 per cent. It is more than probable that only a small part of this mortality was directly due to measles, but to certain sequelae, notably pneumonia. The average annual morbidity rate of measles per thousand of strength was 30.41, the maximum 77.57 (during the first year), and the minimum 1.98 (during the last year). Although there are no exact reports, it appears that measles prevailed in the Confederate Army and was much more highly fatal than in the Union Army. Prof. Paul F. Eve says concerning measles:

[9] Part Third, Medical Volume.

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In the Confederate Army measles prevailed extensively in the new regiments, especially in those from the country, and greatly impeded their organization. It so diminished the effectiveness of the troops and proved so fatal in camps that companies, battalions and whole regiments had to be disbanded for a time, and the men sent home.

As the men came within the influence of the contagious foci, the disease spread, giving a sudden elevation to the line of prevalence which therefore fell until fresh accessions occasioned a corresponding rise in level. The highest rates occurred in the early months when the commands were small and unprotected by previous attacks. In subsequent periods, the increased prevalence of rates, if calculated on the strength of the new regiments only, would probably have been equally high, but calculated as they have been on the mean strength, part of which had lost its susceptibility to the disease, they are necessarily lower than those of the earlier epidemic reports.

Recruits from the city are more likely to have passed through the disease in childhood than those from rural districts. City regiments are therefore to be preferred in this connection.

The advisability of intentionally subjecting men to measles under proper sanitary conditions was considered:

Inoculation for smallpox was practised before the discovery of vaccination. However, the efforts of sanitary officers have been so successful in controlling the spread of communicable diseases that few medical men would counsel the intentional propagation of measles among large bodies of newly organized and susceptible troops.

Isolation proved ineffective in restricting the disease during the war, but there is no record of its having been systematically carried out.

Scarlet fever was rarely seen during the Civil War. Among the white troops 578 cases were reported, 70 of which, or 12.1, were fatal. Among colored troops the cases numbered 118, with but 2 deaths, equivalent to a mortality rate of only 1.7 per cent. This was, therefore, one of the exceptional diseases less fatal to the negroes than to the white men.

Mumps occurred to a notable extent immediately in the first year of the war, when 40 cases were reported among every 1,000 men; the rate of prevalence fell to 23 in the second and third year, to 14 in the fourth year, and to less than 3 in the fifth year.

The average annual morbidity from pneumonia among white troops was 27.8 and the death rate 6.21. Among colored troops the annual morbidity was 88 and the mortality 27.29.

Pneumonia was much more prevalent among the Confederate than among Federal troops. Among the former this disease annually affected 103 men of every 1,000, while the corresponding rate for Federal

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white troops was 34, and the cases reported as acute bronchitis and catarrhs numbered 415 yearly per 1,000 among Confederate troops, as against 192 in the Union ranks.

Among the Confederate troops operating in South Carolina, Georgia and Florida during the nineteen months, January, 1862, to July, 1863, inclusive, there were 2,220 cases of pneumonia, of which 127 terminated fatally in the field and 370 in the hospital, making a total of 497 deaths, equivalent to 22.4 per cent of the whole number of cases.

A table shows a Confederate death rate from pneumonia of 20.6 per 1,000 strength, as compared with the Union rate of 7.8. The average annual rate of deaths from pneumonia among southern prisoners in northern camps was 59.9 per 1,000, while the annual rate from the same cause at Andersonville was 27.4.

Acute bronchitis was reported as responsible for 168,715 cases of sickness in the Federal Army, and of these 650 terminated fatally. This applies only to white troops. Among the colored troops the average annual rate for bronchitis was 123.5.

It will be seen from the above that then, as now, measles, mumps and pneumonia were highly prevalent among the troops, both north and south, and that measles and pneumonia were much more prevalent and much more fatal among southern than among northern soldiers. Sickness and death in camp have been greatly lessened since Civil War days, as Chart VIII will show.

If we can explain why the rural man is much more susceptible to pneumonia than his urban brother and why the southern soldier is much more susceptible to the same disease than his northern comrade, we will have a basis on which to work in our attempts to lessen the morbidity and mortality from pneumonia in our camps. We are aware that we are only on the threshold of this investigation, and that more extensive and exact data may modify our views, possibly radically change them, but, at the risk of falling into error, we are venturing certain suggestions.

In the first place, we recognize that no sharp line can be drawn between rural and urban life. It is customary to classify those communities with a population of less than 2,500 as rural, but this is arbitrary, and we must recognize the fact that our population is not fixed but is in a condition of constant flux. Because a soldier comes from a farm does not mean that he has not passed much of his life, even recently, in some crowded community, but the large masses of men with which we are dealing may justify a rough

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THE FRUITS OF PREVENTIVE MEDICINE

BY MAKING USE OF OUR INCREASING KNOWLEDGE OF MEDICINE AND SANITATION SINCE CIVIL WAR TIMES IT HAS BEEN POSSIBLE TO PREVENT HALF A MILLION CASES OF DISEASE AND SAVE THE LIVES OF

TEN THOUSAND SOLDIERS

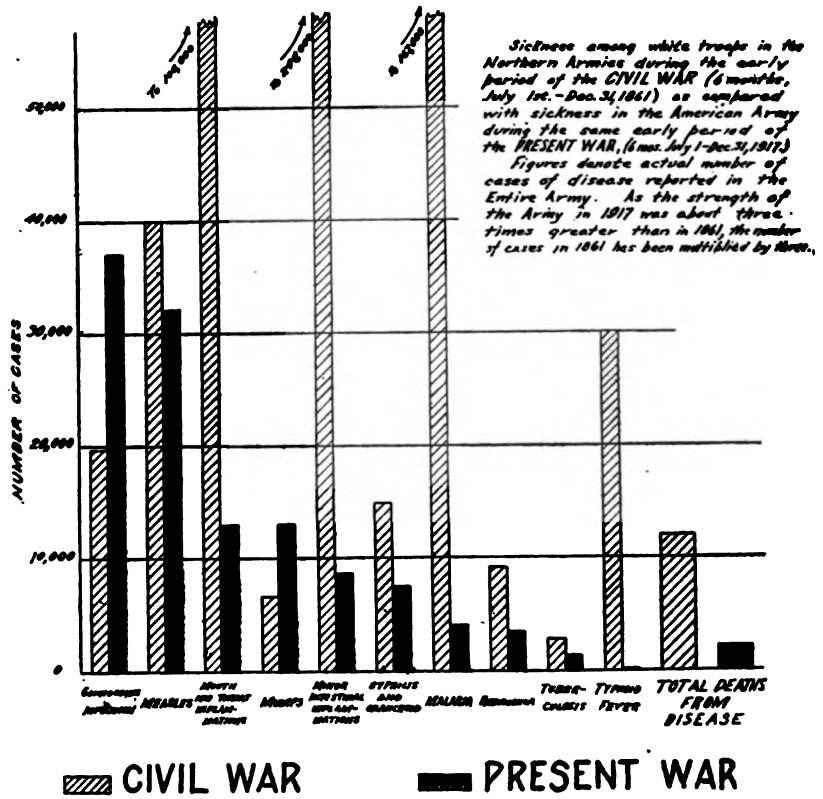
Sickness among white troops in the Northern Armies during the early period of the CIVIL WAR (6 months, July 1st.-Dec. 31, 1861) as compared with sickness in the American Army during the same early period of the PRESENT WAR, (6 mos. July 1-Dec. 31, 1917.)
Figures denote actual number of cases of disease reported in the Entire Army. As the strength of the Army in 1917 was about three times greater than in 1861, the number of cases in 1861 has been multiplied by three.
NUMBER OF CASES
50,000
40,000
30,000
20,000
10,000
0
MEASLES
TYPHOID FEVER
TOTAL DEATHS FROM DISEASE
CIVIL WAR
PRESENT WAR

CHART VIII

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classification into rural and urban. Camp life is more crowded than that of most conditions of civilian life, even in the most densely congested areas of our largest cities. When we speak of "crowding" in camp we are most likely to have in mind sleeping quarters, and we demand in these not less than 50 square feet of floor space per man, but while proper space in sleeping quarters is a matter of importance, men may be dangerously crowded even out of doors. The acute respiratory diseases are transmitted by the transference of organisms from the respiratory tract of one man to those of another: to put it bluntly, "by spitting into one another's face," and this occurs more frequently in the waking than in the sleeping hours. Crowding in camp life is a military necessity. It may be reduced to a minimum, and every effort should be made to do this. In an assembly hall in one of our camps where several thousand men are seated night after night, if every man sits upright and moves his head neither backward nor forward, the greatest distance between his nose and that of the man in front or behind is 26 inches, and to right or left, 16 inches. In such an assembly with one-half the men coughing, one can have some idea of the extent to which respiratory bacteria are being transmitted. This condition would not be materially altered by the removal of the walls and roof of the hall. On the other hand, the transfer of respiratory bacteria may be quite indirect. They may be carried in dust, and it is not surprising that the acute respiratory diseases have increased after dust storms, as has been shown to be the case at Funston, Bowie and at other camps.

Pneumonia is an urban or a crowd disease in both civilian and military life. Our camps are the most crowded cities in our country, and consequently they furnish the highest rates for the respiratory diseases.

The man who has lived in a densely populated area is more resistant, because he has been exposed to the same bacteria before, probably many times, and has acquired more or less immunity or an increased resistance. For a converse reason, the man who has lived in a sparsely settled community is the more susceptible because he has never before, or has not recently, harbored these bacteria. We again call attention to the maps showing the location of the camps and areas from which their soldiers were drawn (see Charts XVIII and XIX). The soldiers less susceptible to pneumonia are from the most densely populated areas.

In the south, under ordinary conditions of civilian life, pneumonia is relatively rare, but, when it does appear, is highly fatal,

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and is highly fatal because it is rare. The average southern lad has never, or but seldom, been brought into contact with the organisms which cause pneumonia, and when they are sprayed into his face he falls a ready victim, just as the American Indians and Fiji Islanders were decimated by measles, and as smallpox aided the Spaniards in their conquest of Mexico. Many illustrations along this line will occur to the student of epidemiology.

MEASURES FOR PROTECTION AGAINST PNEUMONIA AND RESPIRATORY DISEASES

In our efforts to lessen morbidity and mortality from the acute respiratory diseases, especially pneumonia, we must endeavor to develop the resistance of the soldier to the causative organisms. In the accomplishment of this purpose many procedures are possible. Up to the present time, we have relied upon attempts to limit the number of infecting organisms finding access to the susceptible man by wearing masks, by placing the sick in cubicles, by the employment of disinfecting agents, etc. These methods have probably been of value—how much we cannot say—but they are applicable only to the sick in hospitals, in detention camps or in quarters, and are not applicable to the great masses of the soldiers. The most scientific and the most promising procedure lies in vaccination. This has already been tried in some camps. At Upton, more than 12,000 out of a division of about 30,000 were vaccinated against pneumonia, and during the following two months, during which the practically unbroken division was under observation, the protective value of the vaccination seemed to be quite in evidence. In other camps, vaccination has been cautiously used, but up to the present time there have been established no standard methods, and it would be premature to make any definite claims. It is worthy of note, that in South Africa vaccination against pneumonia has been resorted to, with at least the promise of success. Enough has been done along this line to demonstrate that vaccination with pneumococci properly done results in no injury. In this procedure, the number and virulence of the organisms introduced are absolutely under control. It is the scientific method of increasing resistance. It is not probable that the increased resistance to pneumonia secured by any method continues indefinitely, since one attack of the disease does not protect for any great length of time (at least not against subsequent infection), but temporary advances in resisting power would be of great service.

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We might learn something from the natural process by which increased resistance to the acute respiratory diseases is developed. This is secured apparently by gradual adaptation to the conditions of crowd life. Instead of taking our new soldiers from the comparative isolation of rural life and placing them immediately in crowded camps, they should be assembled in small groups at their homes, drilled and prepared for camp life more gradually. There should be a reserve army and, for every man sent to a training camp, two should be added to the reserve army. These men should be permitted to continue their civilian functions, but should wear a distinctive uniform, be under strict discipline, have their vaccinations and drill in squads of gradually increasing size, and thus slowly be introduced to the conditions of "crowd" life.

The difference between the "raw" and "seasoned" soldier, so far as susceptibility to the infectious diseases is concerned, in our opinion, is explainable as here suggested. The former is without previous recent exposure to "crowd" bacteria and falls a ready victim. The latter, on account of frequent exposure to "crowd" bacteria, shows a certain degree of immunity or at least increased resistance. The present method of mobilization is conducive to the spread of the acute respiratory diseases. For instance, select men in Florida are assembled at certain points in that state and shipped to Camp Wheeler, in Georgia, in troop trains. It has appeared that as many as six cases of fully developed measles have been found on one of these trains on its arrival at Camp Wheeler. Those reaching the camp not actually ill are sent to the depot brigade or to a detention camp. On a certain day a colored contingent of drafted men from Alabama, which had never been in a camp, reached Camp Custer, in Michigan, and was placed in the depot brigade. During the following month, the epidemiologist at Custer reported "80 per cent of the cases of pneumonia arose in the depot brigade, which is the receiving place and also the distributing point for arriving recruits." Moreover, the type of the dominant pneumonia at Custer changed after the arrival of the Alabama troops. This experience has a parallel in many camps. It is worthy of note that of the 86 cases of pneumonia reported from Custer for the month following the arrival of the Alabama contingent, 69 came from the depot brigade, and of these 50 from the Alabama contingent.

The plan of having several hundred naked men, closely crowded, pass through the physical tests appears to be, at present, a military

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necessity, but that it affords ready means for the distribution of the acute respiratory diseases is evident. It would be far better if all these examinations, vaccinations, etc., could be done in the reserve army which has been suggested. The transfer from the comparative individualism of civilian life to the intense communalism of military life should be more gradual. The impossibility of bringing an effective army into existence "over night" is as evident to the sanitarian as it is to the military man.

To hope to reduce infection among our soldiers to the minimum without adequate attention to the health of the civilian population from which the soldier comes, and with which he mingles more or less freely, is without justification. If it be wise to protect the soldier by compulsory vaccination against smallpox and typhoid fever, why is it not right to protect the prospective soldier, the young man who is to be called next month or next year, against the same infections in the same way? All the infections which have appeared in the camps are distributed among the civilian population from which the soldiers in the camp have come. As an illustration, the following figures (Table XVI) show the present prevalence of infections in North Carolina. The figures indicate new cases reported every week.

TABLE XVI.—*Infectious Diseases in the State of North Carolina from April 6 to June 29, 1918*

Disease	April				May				June				
	6	13	20	27	4	11	18	25	1	8	15	22	29
Whooping cough	177	198	273	263	337	298	387	355	467	567	443	993	476
Measles (both kinds)	338	365	337	386	325	201	275	298	211	149	138	95	93
Diphtheria	18	9	19	14	10	10	12	16	8	8	9	14	10
Scarlet fever	11	6	4	10	2	8	7	8	7	2	11	15	18
Septic sore throat	...	...	...	...	...	...	...	...	5	6	5	1	5
Smallpox	31	13	18	32	36	52	14	15	18	11	13	17	17
Chicken-pox	...	...	...	...	...	...	...	14	15	21	16	7	5
Infantile paralysis	...	...	...	...	...	...	...	3	1	...	...	1	1
Typhoid fever	10	8	3	6	7	12	11	12	17	29	48	76	98
Meningitis	5	2	6	6	1	3	2	5	1	3	3	1	1

Draft men from all parts of North Carolina are being sent to Jackson and Sevier and carry the infections with them. These arrivals constitute infected and susceptible material. They carry

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both the spark and fuel. If these men were organized and drilled in small squads at home and gradually inducted into military life, and only those found to be free from infection sent to the camps, the control of communicable disease among the soldiers would be greatly aided.

MEASLES

The morbidity from measles presents an entirely different picture from that of pneumonia. The highest morbidity rate from pneumonia was fourteen times that of the lowest. In the case of measles the highest rate was sixty-two times that of the lowest. Measles is thus seen to be much more epidemic in character. It exhibits an explosive characteristic in the suddenness with which it breaks forth and recedes. This is illustrated in the case of Camp Wheeler. The dates and morbidity rates were as follows:

TABLE XVII

For week ending	*Annual measles morbidity rate per* 1,000
October 19	88
October 26	428
November 2	615
November 9	1,760
November 16	2,200
November 23	1,120
November 30	248
December 7	240
December 14	19

Measles was present to an excessive degree in practically the same camps which experienced trouble from pneumonia. Southern troops suffered most severely from this sickness. The mortality from measles is, of course, a minor factor when compared to that from pneumonia. Measles, however, has been a serious disease because, in addition to the time lost and the great numbers incapacitated, it has been a forerunner of pneumonia in many instances.

From statistics collected during the month of February at Camp Wheeler, it was found that 14 per cent of the pneumonia cases were preceded by measles. It is believed that this figure is much higher in some of the other camps. Including measles, mumps and colds of one kind or another, this group of diseases preceded pneumonia in 68 per cent of the pneumonia cases at Wheeler.

The average morbidity rates for measles in each camp, as well as the mortality rates, are given in the following table:

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TABLE XVIII.—*Morbidity and Mortality from Measles in Order of Prevalence at National Guard and National Army Camps. (6 Months Period, September 29, 1917, to March 29, 1918)*

(Figures represent annual rate per 1,000)

Camp	Army	Morbidity rate	Death rate
Pike	N. A.	390	0.15
Bowie	N. G.	374	0
Wheeler	N. G.	297	0
Sevier	N. G.	294	0.15
Beauregard	N. G.	256	0.11
[illegible]			
Jackson	N. A.	230	0.33
Gordon	N. A.	168	0.21
Shelby	N. G.	160	0.16
Funston	N. A.	155	0.07
Kearny	N. G.	141	0
[illegible]			
Taylor	N. A.	129	0
Doniphan	N. G.	129	0.08
Travis[1]	N. A.	124	0
Cody	N. G.	122	0
Dodge	N. A.	92	0
[illegible]			
Lee	N. A.	85	0.19
Sherman	N. A.	65	0.38
Custer	N. A.	65	0.49
Grant	N. A.	58	0.08
Logan	N. G.	51	0
Sheridan	N. G.	41	0
Meade	N. A.	36	0
Devens	N. A.	36	0
McClellan	N. G.	34	0
Dix	N. A.	34	0
Lewis	N. A.	28	0
Hancock	N. G.	8	0
Wadsworth	N. G.	7.9	0
Upton	N. A.	6.3	0

(See Chart IV for measles morbidity in camps.)

The highest mortality rate from measles was at Camp Custer. Even this rate is small, compared to that for pneumonia. It may be pointed out that many camps with high measles rates show few or no deaths from this cause. This is explained by the fact that the more serious cases were complicated with pneumonia and the death rate charged to this cause instead of measles. This is a more probable explanation than that of a difference in virulence of the infecting organism. It seems highly improbable that the case mortality rate at Camp Bowie was zero while that at Camp Custer was about

[1] This rate is lower than it should be, as many cases were not reported in the fall of 1917.

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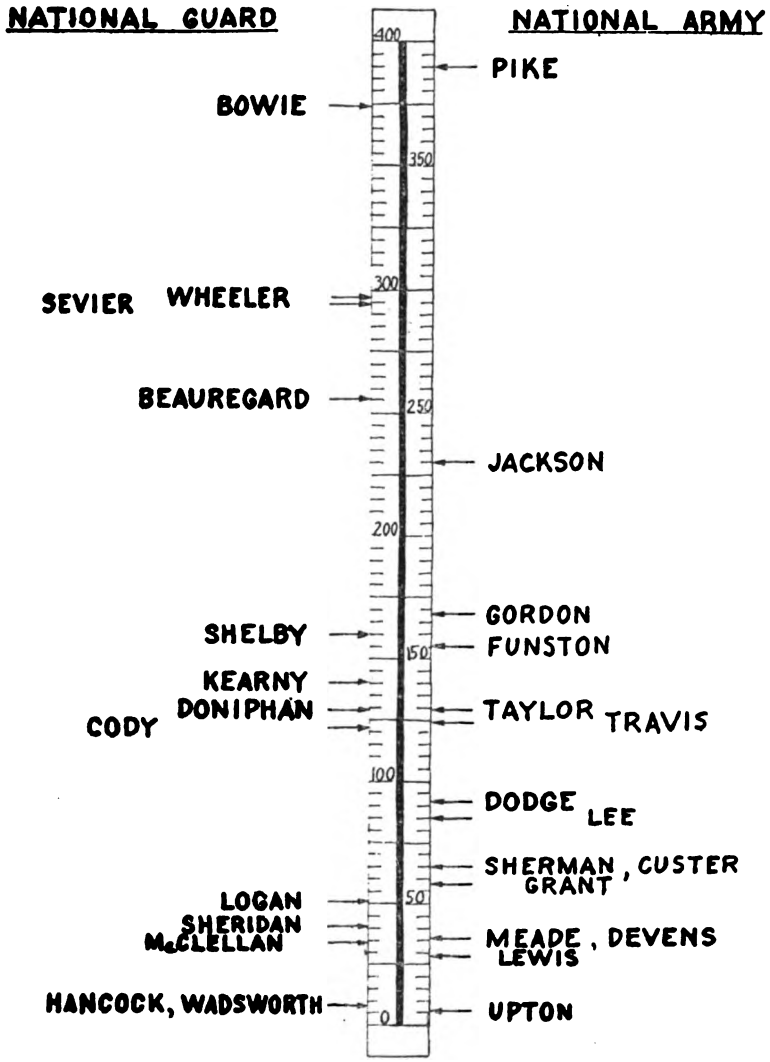
MEASLES IN ARMY CAMPS



ANNUAL MORBIDITY RATE PER 1000
SEPT. 29, 1917 TO MAR. 29, 1918.

CHART IX

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0.8 per cent. With a case mortality rate of 0.8 per cent at Bowie we should have had a death rate of about 3.0 per 1,000.

Comparative measles statistics for civilian life are obtainable only in an indirect manner. The morbidity rates from this cause

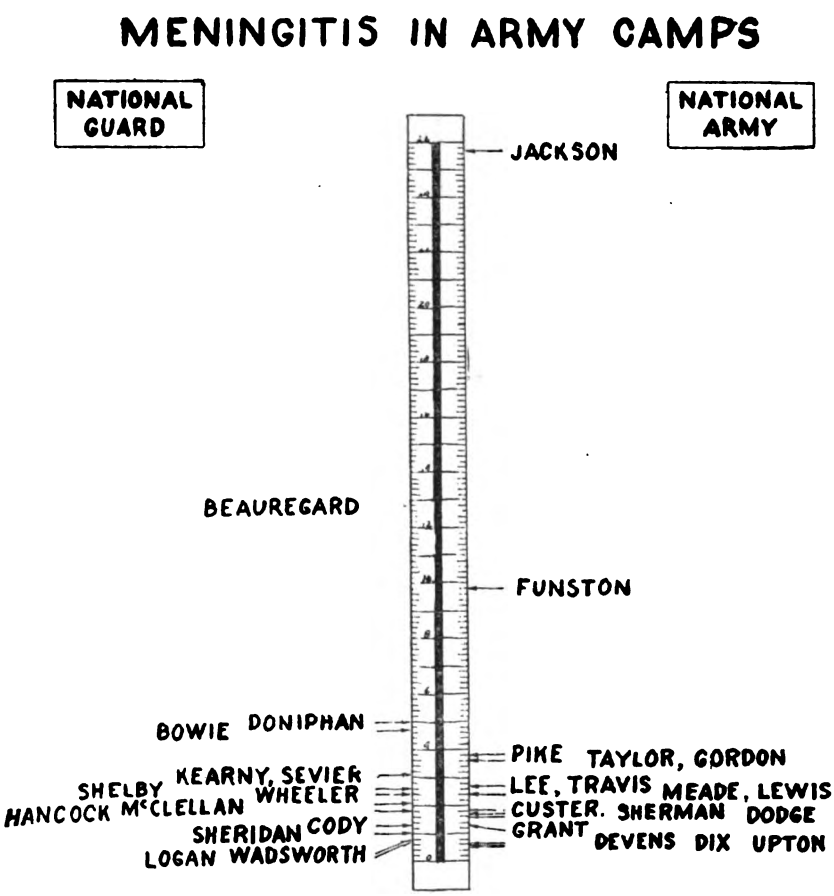

CHART X

for the six winter months of the past year range from 1.0 per 1,000 for the state of Vermont to 12.4 per 1,000 for the state of Virginia. These rates are for people of all ages. Inasmuch as the mortality from measles for the age group 20 to 29 years is but a few per cent of that for all ages, it is probable that the morbidity rates for the states and cities rarely approach 1.0 per 1,000.

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As the morbidity rate for all National Guard and National Army camps was over 6.0, it is quite evident that measles has been appreciably greater in the Army.

The weekly incidence of measles has been pictured on the charts for pneumonia already mentioned.

MENINGITIS

Meningitis in its various forms has appeared in every camp during the six winter months. The prevalence of this disease at Camp Jackson, however, has stood out above that at all other camps. The marbidity here has been just twice that at the camp having the next highest rate. Next to Jackson stand Beauregard and Funston. These rates are 25.7, 12.8 and 9.8, respectively. Next comes Doniphan with 5.0, and the other camps follow with rates at close intervals, the figures receding gradually from this point (see Table XIX).

The three camps with highest morbidity rates likewise have the highest death rate. Beauregard, however, shows a death rate even greater than Jackson. Again, the southern troops have suffered most severely from this disease. Those escaping it are the troops from the northeastern and northern sections of the country.

Meningitis, next to pneumonia, has been the most serious disease which the Medical Corps of the Army has had to meet. It is serious by reason of its high fatality and also because this, of all diseases, shows the greatest excess over the disease in civilian communities. It will be recalled from the early part of this report that meningitis was estimated to be forty-five times as prevalent in the Army as in civilian life, whereas the figure for measles was nineteen and for pneumonia twelve. For this past winter we have the figures only for New York City and Pittsburgh, within the age group 20 to 29 years. The annual death rate for meningitis per 1,000 was 0.038 for New York and 0.047 for Pittsburgh. The death rate for all ages in New York City was 0.043. The rate for age group 20 to 29 years is thus 88 per cent of that at all ages. Applying this factor to the rates in the various states, we can obtain a rough approximation of the rates for the specific age group in these states (see Table XX).

Accepting the rates thus obtained for what they are worth, we may contrast these figures with those for various army camps (see Table XXI).

It is evident from Table XXI that there is an excess of meningitis even in those camps which have been unusually free from pneumonia and measles. Camp Dix has next to the lowest death

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TABLE XIX.—*Meningitis (all forms) in National Guard and National Army Camps*
(Figures represent annual rate per 1,000)

Camp	Army	Morbidity rate	Death rate
Jackson	N. A.	25.7	7.5
Beauregard	N. G.	12.8	7.7
Funston	N. A.	9.8	3.6
Doniphan	N. G.	5.0	1.8
Bowie	N. G.	4.7	1.6
Pike	N. A.	3.8	2.4
Taylor	N. A.	3.6	1.3
Gordon	N. A.	3.6	0.96
Sevier	N. G.	3.1	1.1
Kearny	N. G.	3.1	0.77
Lee	N. A.	2.7	1.2
Travis	N. A.	2.7	2.5
Shelby	N. G.	2.6	0.71
Wheeler	N. G.	2.4	2.1
Meade	N. A.	2.4	0.66
Lewis	N. A.	2.4	0.67
McClellan	N. G.	2.1	0.41
Hancock	N. G.	1.8	0.44
Custer	N. A.	1.8	0.30
Sherman	N. A.	1.7	0.32
Dodge	N. A.	1.6	1.1
Cody	N. G.	1.3	0.50
Grant	N. A.	1.2	0.31
Sheridan	N. G.	1.0	0.18
Wadsworth	N. G.	0.78	0.20
Logan	N. G.	0.73	0.22
Devens	N. A.	0.63	0.28
Dix	N. A.	0.57	0.19
Upton	N. A.	0.54	0.34

See Chart X for morbidity in camps

TABLE XX.—*Meningitis in Civil Communities*
(Figures represent annual death rate per 1,000)

Place	Rate for all ages	Rate for age 20 to 29 years (Computed by using New York City factor of 88 per cent)
Vermont	0	0
Virginia	0.16	0.14
Delaware	0.12	0.11
Connecticut	0.038	0.034
Massachusetts	0.042	0.037
Colorado	0.12	0.11
Michigan	0.096	0.085
St. Louis, Mo	0.047	0.042
New York City	0.043	0.038

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TABLE XXI.—*Meningitis in Civil Life (Age 20 to 29 Years) and Army Camps (Six Winter Months, 1917–18)*

(Annual death rates per 1,000)

Place	Civil rate	Army rate	Camp	Source of troops
Vermont	0			
Connecticut	0.034	0.028	Devens	New England States.
Massachusetts	0.037	0.024		
Virginia	0.14	1.2	Lee	Virginia, West Virginia, Pennsylvania.
Delaware	0.11	0.19	Dix	Delaware, New Jersey, New York.
Colorado	0.11	3.6	Funston	Colorado, Arizona, Kansas, Missouri, Nebraska, New Mexico, South Dakota.
Michigan	0.085	0.30	Custer	Michigan, Wisconsin.
New York City	0.038	0.27	Wadsworth	New York.
		0.20	Upton	New York.
		0.34		
Pittsburgh	0.047	0.44	Hancock	Pennsylvania.

rate of all the camps, namely, 0.19 per 1,000. People of age group 20 to 29 in the state of Delaware show a rate for the past six months of 0.11 per 1,000. The camp rate is nearly twice as great as a comparable civil community in this instance. Camp Devens has more than ten times the rate of certain New England states; Camp Lee has nearly ten times the rate of Virginia; Camp Funston has more than thirty times the rate of Colorado; Custer has three and a half times the rate of Michigan; Camps Wadsworth and Upton are seven times greater than New York City; Camp Hancock has nearly ten times the rate of Pittsburgh. If the rate for Louisiana is at all like that for Virginia—namely, 0.14 per 1,000—we find that Camp Beauregard's rate of 7.7 would be in the ratio of 55 to 1.

It seems quite evident that meningitis has been most prevalent in those camps whose soldiers come from areas in which this disease has been endemic. For some years meningitis has been widely scattered in South Carolina and adjoining states, and it appeared among families of the workmen engaged in building the barracks at Camp Jackson before the troops began to assemble, and during the period covered by this report it was reported in many places in South Carolina. Meningitis has been endemic in Missouri and Kansas for some years and this accounts for its presence at Funston. Here also it appeared among the workmen and their families and in villages near Funston. We have no data concerning meningitis in the civil communities from which the soldiers at Beauregard came. The

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behavior of this disease is a strong argument for a reserve army and for culturing throats before the draft men leave their homes.

In the last three months some thirty or more localities in South Carolina have reported meningitis to the State Board of Health. During this time men from all parts of the State are being sent to Camp Jackson. It must happen that many of them from the infected localities are meningitis carriers. These are less likely to develop the disease than some of those with whom they come in contact. If the drafted men, especially those from the infected localities, were collected in small groups at or near their homes and held until cultures were made, and no carriers sent to camp, in our opinion this disease would be greatly reduced among our sol-

TABLE XXII.—*Scarlet Fever in Army Camps (Six Months' Period—September 29, 1917, to March 29, 1918)*

(Annual rate per 1,000)

Camp	Army	Morbidity rate	Death rate
Pike	N. A.	43.8	0.44
Lewis	N. A.	25.1	0.12
Kearney	N. G.	19.3	0
Sherman	N. A.	17.3	0.19
Dodge	N. A.	15.8	0
Grant	N. A.	12.3	0.23
Meade	N. A.	7.7	0.07
Custer	N. A.	6.5	0.20
Dix	N. A.	6.4	0.09
McClellan	N. G.	3.7	0
Doniphan	N. G.	3.6	0
Funston	N. A.	3.6	0
Cody	N. G.	2.4	0.08
Taylor	N. A.	2.4	0
Sevier	N. G.	1.9	0.15
Sheridan	N. G.	1.8	0
Hancock	N. G.	1.5	0.06
Devens	N. A.	1.5	0
Upton	N. A.	1.5	0
Logan	N. G.	1.4	0
Jackson	N. A.	0.9	0
Wadsworth	N. G.	0.8	0
Lee	N. A.	0.8	0
Bowie	N. G.	0.6	0.08
Shelby	N. G.	0.6	0
Travis	N. A.	0.4	0
Gordon	N. A.	0.1	0
Beauregard	N. G.	0.0	0
Wheeler	N. G.	0.0	0

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diers. As it is, one carrier transmits this infection, and finally some carriers transmits it to a susceptible individual who develops the disease.

SCARLET FEVER

Scarlet fever manifested itself for the most part in Camps Pike, Lewis, Kearney, Sherman, Dodge and Grant. The incidence at Pike stands out by itself, however, as is shown in Table XXII. The rate at Pike is nearly twice that of the second camp in the table. Scarlet fever presents a most interesting problem for the student of community diseases, inasmuch as the rate in the National and Regular Army is three times that in the National Guard (see Table VIII), whereas pneumonia and measles, on the other hand, showed an appreciable excess in the Guard.

The National Army rate is elevated mainly by the camps mentioned above. It is significant that southern camps, with the single exception of Pike, have been free from this disease. The camps most affected have been those containing troops from the Middle and Far West, Lewis, Kearney, Dodge, Grant, Custer; Meade, Dix and McClellan are also among the first ten of the table. Another point brought out by the table is that of the nine camps having the highest morbidity rates, eight are National Army camps. But one camp, namely, Kearney, is a Guard camp.

Just why scarlet fever should be distributed in the above manner, it is very difficult to say. The primary difference between Guard and Nationals is in their housing, the former being quartered in tents, the latter in barracks. The nature of the quarters would not seem to be a factor, or we should expect some of the eastern and southern National Army camps to show scarlet fever, which they do not.

It seems most probable that this peculiar distribution is attributable to the presence of the disease in those particular localities from which these troops are drawn. This would account for the disease in both Kearney and Lewis, which contain men from the same general locality. The limitation of the disease among the National Army troops and its relative exclusion from the Guard may possibly be explained by the later assembling of the Nationals, who brought scarlet fever into the camp after it had developed in the civilian communities. Furthermore, it may be pointed out that there are no Guard camps in the north. Therefore the Guardsmen, on mingling with the civilians in their vicinity, were not brought into contact with the disease as frequently as the men

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from the camps located in the north. This explanation rests on the assumption that scarlet fever prevailed more extensively in the neighborhood of the northern camps than elsewhere. This fact is borne out by Table XXIII.

TABLE XXIII.—*Scarlet Fever in Civil Life (Six Winter Months, 1917–1918)*
(Annual death rates per 100,000)

State	Death rate	Average death rate for section
Vermont	3.3	3.4
Massachusetts	3.3	
Rhode Island	5.7	
Connecticut	1.4	
New Jersey	2.5	4.5
Delaware	6.5	
Indiana	6.3	6.3
Michigan	7.3	
Wisconsin	7.2	
Minnesota	6.6	
Kansas	3.9	
Colorado	1.8	13.2
Montana	24.6	
Maryland	1.6	1.4
Virginia	1.0	
Kentucky	1.5	

These data are very suggestive. Scarlet fever is seen to be much more prevalent in the middle and far west than in the south or east. It was highest in Montana, a state that contributed men to Camp Lewis. It was high in Michigan, Minnesota and Wisconsin, which contributed men to Camps Grant and Custer. It was high in Delaware which sent men to Camp Dix. Camp Sherman's high position in the table is probably due to scarlet fever in Ohio. We do not have death rates for Ohio but, from the morbidity statistics available, Ohio is seen to have a rate almost as high as the western states of Michigan and Wisconsin. Records from the territory contributing to Pike are not available, so that nothing can be said as to the influence of civilian diseases on the scarlet fever incidence at Pike.

DIFFERENCES IN THE BEHAVIOR OF MEASLES, PNEUMONIA, MENINGITIS, AND SCARLET FEVER

Certain differences in the characteristics of the diseases above mentioned are revealed in Chart XI, where there are plotted the

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morbidity rates for the National Guard and National Army camps combined. The scale of the plot has been adjusted so as to bring the curves of each disease near together, otherwise there would be little opportunity for comparison, as the meningitis curve would scarcely appear at all if plotted to the same scale for measles. These curves are designed to show the seasonal occurrence of the disease.

In the upper diagram there will be noted a surprising similarity between pneumonia and meningitis. Although pneumonia was about ten times as prevalent as meningitis, both diseases progressed at about the same rate and, except for a period during December and January, are parallel throughout the six-months period. In a sense their occurrence has been epidemic in nature, as there is a distinct though blunt peak to the curves. The breadth of this peak extends from November to February with the greatest incidence during January and February.

The upper curves present a far different appearance from those of measles and scarlet fever. The measles curve is distinctly epidemic in character. It exhibits a sharp peak. The disease increased enormously during November and started to recede just as sharply. Then its rate of recession decreases and it flattens out very gradually, reaching a level the first of March.

Scarlet fever acted differently from the other three diseases. Beginning in October it gradually ascended and did not reach its maximum height until fifteen weeks later. Aside from the fact of its gradual ascent, the scarlet fever curve resembles pneumonia and meningitis more closely than it does measles.

There are many factors which have governed the incidence of these various diseases. In these curves measles stands out as a disease of distinctly epidemic character, a disease that is highly infectious and spreads rapidly. It is only the susceptibles or those who have not had measles who are attacked. Upon exhausting the susceptible material the disease disappears. This fact will be appreciated when we recite the experience at Camp Wheeler (see Chart XXI). From an annual morbidity rate of 2,200 for the week ending November 16, the rate dropped to zero on January 11, and with the exception of a few cases during three weeks in February and March, there has not been *a single case of measles* at Wheeler as late as June 28. This is a remarkable illustration of how a disease such as measles can literally take a census of every susceptible individual in the camp and, when finished, die out completely for want of further sustenance.

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SEASONAL OCCURENCE OF COMMUNICABLE DISEASE IN NATIONAL GUARD AND NATIONAL ARMY CAMPS

6 WINTER MONTHS, SEPT. 29, 1917 TO MAR. 29, 1918.

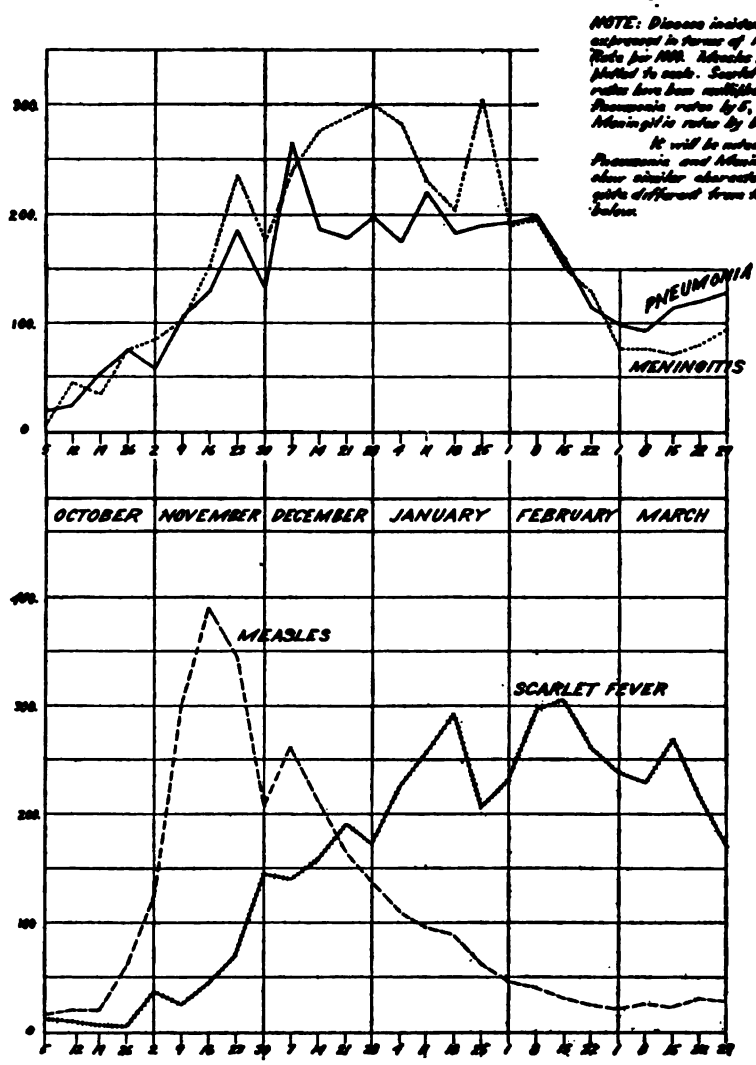
NOTE: Disease incidence is expressed in terms of Annual Rate per 1000. Measles has been plotted to scale. Scarlet Fever rates have been multiplied by 25, Pneumonia rates by 5, and Meningitis rates by 50.
It will be noted that Pneumonia and Meningitis show similar characteristics quite different from the curve below.
PNEUMONIA
MENINGITIS
OCTOBER
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
MEASLES
SCARLET FEVER

CHART XI

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With measles it matters not as to the condition of health. The disease progresses as the infection is spread amongst the susceptible population.

With pneumonia and meningitis there is a difference. Tests have shown that many people carry the germs of these diseases and yet possess good health. It is not until the vital resistance is sufficiently lowered by fatigue or exposure, that the disease germs present become activated and pass through the body's protective gates which have been opened to them.

Scarlet fever resembles pneumonia and meningitis in the curves, more so than it does measles. This was epidemic in a few camps, but was far less prevalent and less widespread than measles. Every camp had measles, pneumonia and meningitis. There were no cases of scarlet fever reported at two camps, and the morbidity rate was less than 1.0 per 1,000 in nine camps.

From the statistical analysis before us, scarlet fever is less infectious than measles, is less widely disseminated, and has less susceptibles among the population.

(*To be concluded*)

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A HISTORY OF THE BASE HOSPITAL, CAMP SHERMAN, CHILLICOTHE, OHIO

By Lieut. Col. CASEY, A. WOOD, M. C., U. S. A.
Office of the Surgeon General.

(With one illustration)

THE data that have made the following account possible were mostly furnished by Lieut. Col. E. G. Huber, C. O., and the heads of service in the base hospital at Camp Sherman. Some other details were gathered by the writer during a residence in the hospital as Chief of the Head Surgery Section, during the months of September, October, November and December, 1917. The technical description of base hospital construction is furnished by the courtesy of Maj. H. B. Price, S. C., Division of Physical Reconstruction, Office of the Surgeon General, Washington, D. C.

Geographical Location.—The hospital group is about 3 miles from the center of the town of Chillicothe (15,000 inhabitants, 1915), Ross County, Ohio. It lies in latitude 39° 22′ north, longitude 83° 1′ south, 54 miles from Columbus, the capital of the state.

The choice of a site upon which to build Camp Sherman and with it the base hospital group was influenced by the fact that it is an historic military spot. In this region, then a part of the old Northwest Territory, a detention camp was established for British prisoners of the War of 1812; and it is an interesting commentary on that fact that some of their descendents assisted in the erection of the buildings and in preparing the grounds of the hospital. Moreover, a portion of the camp site was in the early days occupied by an old Indian stockade, used for camping and war purposes by the aborigines.

Climate.—The Scioto valley, in which the base hospital is situated, although not far from the Kentucky line, is usually quite cold in winter; the thermometer in January and February often reaches zero Fahrenheit, or below it, and there is generally plenty of snow during these months. The summers are sometimes quite hot.

Terrain.—The hospital buildings were erected facing the Frankfort pike, between it and the low range of hills that encircle the flat valley plateau on which the camp proper is built. There are scattered groups of trees along the highways and on the hills.

The soil (cultivated farm land) is a sandy gravel covered by a layer of "gumbo" clay of varying thickness. Water-smoothed, small-sized gravel, containing very few boulders and admirably ad-

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apted for road building, can almost everywhere be found at a depth of from 3 to 10 feet. The principal objection from a hospital standpoint to the site as a cantonment hospital is this upper-soil deposit of clay, commonly known as "gumbo." After rains this stratum is readily converted into an adherent mixture that is easily carried into the hospital buildings and which, in spite of steel scrapers and other devices, it is almost impossible to remove from army footwear. In continued dry weather, also, the clay forms a fine, impalpable dust which rises in clouds from the dirt roads and filters through the screens of neighboring windows.

There are no disagreeable prevailing winds.

Roads.—At first there were few concrete or asphalted roads or streets in or near the hospital. This defect was slowly remedied, however, until in the spring of 1918 cindered walks and roads were built all over the site of the hospital. To prevent the plague of gumbo clay mud and dust, concrete and asphalted roads must succeed the "dirt" or imperfectly surfaced highway that passes in front of and about the hospital grounds.

The water supply, from artesian wells, has been demonstrated to be remarkably clear and bacteria-free, but impregnated with iron and lime salts; hence quite hard and pleasant to drink, although far from ideal for washing purposes or for use in the boilers of the heating plant and laundry, owing to the deposition in them of ferro-calcic salts. The water supply of the whole camp is obtained from one large dug well and five drilled wells, located in the northeastern portion of the cantonment property, near the Scioto River. All of these wells secure their supply from an excellent water-bearing gravel stratum at depths varying from 80 to 90 feet from the surface.

The "dug" well is 20 feet in diameter and about 70 feet deep and is cased with steel piling supported by a wood templet or centering. The top of the well is curbed with brick and concrete and provided with a tight wooden cover. Two of the drilled wells are 6 inches, and three of them 8 inches, in diameter. They are located about 250 feet apart.

The water from the wells is pumped by means of motor-driven centrifugal pumps. Four of these pumps are located in the main pumping station and are of sufficient capacity to furnish 750 gallons per minute each against a head of 250 feet. The small centrifugal pumps have a capacity of 400 gallons per minute and pump the water into a suction well of 25,000 gallons capacity near the pump-

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ing station, the suction lines for the main pumps being connected with this well.

It is estimated that an average of about 2,000,000 gallons of water per day will be used at Camp Sherman, although the maximum rate of consumption may be three times this amount.

The water is pumped directly through the distribution system to four 100,000-gallon storage tanks located on a hill northwest of the cantonment. These tanks are constructed of red wood on concrete foundations, and are about 220 feet above the water in the wells. There are also two 25,000-gallon wood tanks located on the hill above the hospital group at the same elevation as the main storage tanks. This additional water supply will not only help, from the ordinary consumption point of view, but it will mean more protection in case of fire.

The distribution system is made up largely of wood pipe from 6 to 14 inches in size, and it extends throughout the cantonment. Hydrants are provided at frequent intervals, and small service pipes are connected with the various lavatories and kitchens. As an additional sanitary precaution a liquid chlorine disinfection device is provided at the pumping station to disinfect the water supply in case of emergency.

The rate of consumption of water and the total amount of water pumped is measured at all times by an automatically recording meter on the discharge main at the pumping station.

Sewerage.—The main sewerage system of Camp Sherman, of which the hospital system forms a part, consists of two trunk sewers from 8 inches to 24 inches in size, one of which is located on each side of the cantonment, discharging into an outfall sewer 30 inches in size. This sewer in turn joins a treatment plant, located on the Lemuel B. James property along the Baltimore and Ohio Railroad, to an outlet in the main channel of the Scioto River, a small stream that skirts the east boundary of the camp, at a point near the outlet of the most northerly sewer for the town of Chillicothe.

Connected with the main trunk sewers is a large number of 6-inch lateral sewers extending to the various lavatories and kitchens throughout the cantonment. Manholes, located at frequent intervals, are constructed of concrete with wood covers.

The sewage is disposed in two concrete septic tanks, 50 feet by 150 feet in plan and having a capacity of 500,000 gallons. The effluent from these tanks is treated with liquid chlorine disinfectant

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solution. This device is located in a separate house adjacent to the tanks and is automatically fed into the tank effluent in proportion to the rate of flow through the tanks.

The *urinals and closets* are of the latest and best types of permanent construction; they empty into the sewage system just mentioned.

Hospital construction at Camp Sherman may be divided into two periods; first, that of camp construction in general, and second, that of readiness for the reception of patients.

During the former period the so-called emergency hospital was very useful and served especially the Bentley organization, and was commonly known as the Bentley Hospital. It was, however, inaugurated and controlled by the Aetna Insurance Company, who had charge of all the insurance of the Bentley employes. This small building was placed at the entrance of the camp, and prominent signs posted all over the cantonment gave instructions to rush all injured men to it. Miss Edna Barker was the nurse in charge, while Dr. Glen Nisley, of Chillicothe, was appointed surgeon. There were generally but a few patients in this small hospital, but it acted as an emergency hospital for the Chillicothe hospital mainly and, later, the embryo base hospital.

Before the buildings of the base hospital had really begun, Capt. K. W. Kinard, of the United States Army Medical Corps, at that time stationed at San Antonio, Texas, had been placed, with his group of assistants, in charge of the sanitary work of the camp and the construction of the permanent hospital. Lieut. Col. Wallace DeWitt was assigned to the cantonment as division surgeon, and Captain (now Major) Kinard was made commanding officer of the base hospital as a division unit.

In the meantime the work of sanitation in the neighborhood of the cantonment had received attention, with Dr. David Rousch in charge. Survey showed that there was immediate need of the establishment of a sanitary district organization competent to handle all existing conditions, as well as those arising from the full increment of soldiers.

The chief work in this sanitary zone was to eliminate conditions that contribute to typhoid fever. Sewer connections on the outskirts of Chillicothe were altered as one of the first moves. Stopping pollution of streams, care in using water from open wells, the cleaning of streets, roads, alleys, vacant lots, and the elimination of dumping grounds were the other measures resorted to in the

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work. In this hygienic movement the State had the full coöperation of the Chillicothe Board of Health and the United States Public Health Service.

On June 20, 1917, the first contingent of troops (to guard construction work) appeared, when Co. D, of the Ohio Engineers, from Cleveland, commanded by Captain Geckler, pitched their tents on the grounds.

Shortly after Major Kinard was selected as commanding officer of the base hospital, his staff began to arrive at Chillicothe. At that time the organization consisted of a small group of officers in barracks B-33. The commanding officer's offices, officers' mess and the enlisted men's mess were all in barracks A-34. With one or two exceptions the officers of the staff slept and had their quarters in barracks B-33. The first officer to report for duty to Major Kinard was Lieut. Chas. C. Crosby, on September 4, 1917. At short intervals thereafter came, in order, Maj. C. R. Holmes, Lieut. Joseph G. McWilliams, Capt. Jas. A. Harvey, Maj. Casey A. Wood, Capt. Chas. Barnett, Lieut. Henry Stanbery and a number of others, so that by the end of November, 1917, the staff numbered about fifty-five. Capt. Frederick Proescher, Lieutenants Samuel Brown, Jas. A. Shaffer, Harold Albaugh, M. Baxter, L. Crawford, John W. Sheetz, Arthur B. Shatto, Louis Effler, Henry Stanbery, Harold Gosline, Geo. M. Logan, Edward McKinley and Joseph G. McWilliams were on the staff proper; Lieutenants Crosby, McKinley, and McWilliams were assigned as assistants to the sanitary inspector. The quartermaster was Lieutenant Schwab.

The single operating room of the future base hospital was for the time the kitchen of barracks A-34, the second story of the building being given up to ward space. The small number of patients, between twenty and thirty, were more than amply provided as to wardmasters, nurses and orderlies by the assignment of an ambulance company of one hundred men recruited from Northwestern University and Evanston, Ill., and at that time stationed at Fort Sheridan, Ill. This fine body of men were, with the patients and personnel of the hospital itself, transferred to the permanent buildings of the base hospital group on the 17th of September, 1917. This portion of the enlisted equipment was, with the exception of some half-dozen men, subsequently detached from the hospital service to various other organizations, but especially to the aviation section of the Signal Corps. In addition to these, twenty-one enlisted men of the medical department of the regular army were assigned to the

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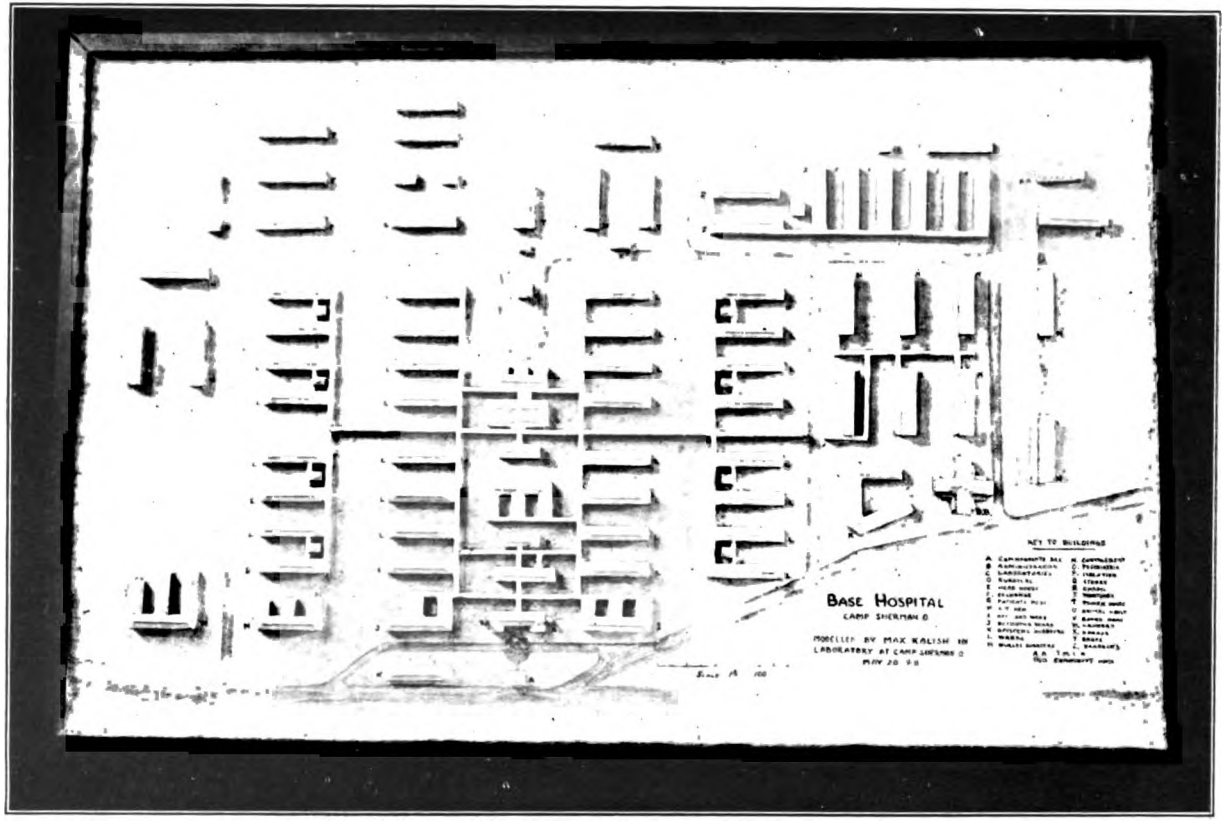

GROUND PLAN, BASE HOSPITAL, CAMP SHERMAN, OHIO

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base hospital, of which fifteen were still on the same duty on November 20, 1917.

The first operation in the temporary ward of barracks A-35 was performed by Captain Barnett of the G. U. Service. This was an epididymotomy, done at night with candle-lanterns for illumination. Local anesthesia was employed and Major Kinard acted as assistant. The equipment was of the most primitive kind; towels, not overclean, were boiled, and a table of rough boards served as an operating couch. However, the patient did quite as well as if he had been treated in the most luxuriously appointed operating room. After this initial operation a number of medical and surgical adventures came to various departments, but especially in the service of Maj. C. R. Holmes and Captain (now Major) Harvey. When an anesthetic was necessary Major Kinard and Lieutenant Stanbery generally acted in these early days as anesthetists.

At last Major Kinard decided that the wards of the base hospital were sufficiently finished to permit of their partial use in receiving bedridden patients, so on September 17, 1917, the equipment of the primitive hospital was, by ambulances and automobile lorries, conveyed to what are now known as wards 9 and 10 of the permanent base hospital, the services being divided into medical and surgical. At the same time the staff officers moved to regular officers' quarters, which they have occupied ever since.

In this connection, it is to be noted that the original plans of the base hospital provided for two such buildings, one on each side of the house allotted to the commanding officer. However, it was discovered that the site assigned on the plan for the second building was the middle of the high road or pike, and so it was not constructed in that locality and not until the following year. In consequence, late arrivals had to be quartered in the officers' ward and elsewhere.

Type of Construction of the Standard Buildings for Base and Cantonment Hospitals.—For the 1,000-bed hospital these are buildings for administration, receiving ward, officers' quarters, officers' ward, nurses' quarters, operating room, X-ray and research laboratory, thirty-two single wards, four isolation wards, kitchen, mess hall, exchange, power-house and heating plant, laundry, commissary stores, repair shop, six barracks with two lavatories, a chapel, mortuary, fire-engine house, garage and guard house. All of these buildings (65 in number) are built of frame construction.

The ward buildings, administration, officers' and nurses quarters and exchange have porches.

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Construction of Frame Buildings.—The foundations consist of three rows of 12″ x 12″ wood piers; four rows for the buildings with porches. In a few instances the piers were built on concrete footings 10″ thick and 2″ square, started below frost and brought up above ground to a level necessary to bring the finished first floor level 3 feet above the grade level. On top of each row of these piers, in a lateral sense, are placed a row of girders consisting of three 2″ x 10″. The first floor joists are 2″ x 10″, 24 inches on centers, lapped and spiked together at the center girder. On top of this are a rough flooring and a finished flooring, both ⅞″ x 4″, 24 inches on centers; roof plate two 2″ x 4″ spiked together. Ceiling joists 2″ x 6″, 24 inches on centers. The outside walls have ⅞″ x 6″ sheathing placed on the studs covered first with heavy building paper, then a 6″ x ⅞″ ship lapped clapboarding. The roof is covered with sheathing and "ruberoil."

The windows are all of the double hung type. Each ward has a central door leading to the porch, and an end door giving on the sun parlor, which was intended to be inclosed in fixed glass sash but was not so finished.

Ridge ventilators are placed, approximately five in number, to each building used for habitation and three for all other buildings. These ventilators are, however, continuous in all buildings erected before April 1, 1918. Concrete floors on wire lath foundation are placed directly on the joists for all toilet rooms, laboratories, operating rooms, etc. Built-in cupboards and bookcases are constructed where required. All wards have the interior walls and ceilings covered by a wall board of approved manufacture, also one side of the partitions is covered with this board. Other buildings have wooden walls, but paper ceilings.

The porch posts are dressed 6″ x 6″, with a simple double running horizontal rail supported by one central upright between posts.

At first there was little privacy and but little chance of improvement, even in permanent officers' quarters. Before a fortnight had elapsed, however, a remarkable change had taken place in them as well as in all the hospital buildings. In the early days only wards 9 and 10 were occupied, by all classes of patients, there being at that time no general infectious cases. The dispensary, in charge of Private Harris, though not a pharmacist, was settled in ward 10. There was, at first, an irregular supply of water, doubtful and insufficient lighting, and no heat, except from a scant supply of coal-oil stoves, a few electric heaters and one or two electric lamps. It

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was also quite a common occurrence to have the electric light fail during the mess hour or at some other critical period, when those officers who possessed candles became quite popular with their fellows. However, these were only incidents in the game, "all in the day's work," and nobody complained either then or afterwards because it was realized that everyone was doing the best he could and that it was his privilege as well as his duty to help others by being as cheerful and as hopeful as possible.

The first operation in the base hospital proper was an appendectomy done by Captain Harvey, Major Kinard acting (on his own request) as anesthetist.

Gradually the necessary equipment was furnished which, supplemented by private efforts and the loans and purchases of members of the staff, produced a really effective hospital.

The number of patients in the permanent hospital on September 17, 1917, was seventeen; on November 30, they numbered 811; while on March 31, 1918, the base hospital was caring for 910 patients in all lines of medicine and surgery. The maximum number of patents was 1,331 on April 10, 1918.

This rapid increase in the number of patients was mainly due to transfers from the regimental infirmaries. Additional wards were opened and equipped as the exigencies of the service demanded, although the equipment was quite scarce and often insufficient, because government supplies came in slowly. However, in a few weeks the whole sixteen wards of the inner hospital group, and finally many of the outer group, were called into requisition, partly because of the natural increase due to the arrival of the draft, partly because of epidemics, such as tonsillitis, cerebrospinal meningitis, pneumonia, and venereal diseases—the latter especially among the colored troops from Oklahoma.

Head Surgery Building.—Following the modified plan of the base hospital group, ground was broken for the head surgery hospital at Camp Sherman on September 28, 1917. Perhaps as good an idea as can be formed of the almost marvelous fashion in which the construction and erection of buildings in this camp were carried on is obtainable from the fact that this special building, with its four operating rooms and their surroundings of special chambers for special work, was practically roughed in and completed in its essentials within a space of ten days. Although, owing to the difficulties of heating and lighting, it was not utilized until the end of October, yet there was soon established a large and flourishing eye, ear, nose

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and throat clinic. The three last departments were under the care of Maj. C. R. Holmes, whose energetic service did more than anything else to build up this portion of the base hospital section. The large dental clinic, with a corresponding number of operations of all sorts, in the same building, was in charge of Maj. (then Lieut.) Ben H. Sherrard, D. C. Maj. J. A. Harvey was brain surgeon.

On October 1, 1917, Major Kinard was relieved of duty at the base hospital and Maj. (now Lieut. Col.) E. G. Huber was assigned to fill the vacancy.

The reason the laboratories, wards and operating rooms of the hospital at Camp Sherman were earlier and better equipped than most of the cantonment hospitals lies in the fact that the commanding general, wearying of the continued and persistent excuses which all the medical officers were, of necessity, obliged to offer in explanation of a lack of the implements and appliances needed for their service, and of the constant apologies they were obliged to make not only to the general himself but to visitors and friends, decided upon a radical step. One day he called together the commissioned officers of the base hospital, the chiefs of services and their assistants, and, after telling them that he expected a change in this state of affairs, ordered them to buy at once such instruments and other equipment as would convert our defective hospital into one of the first class. As a result of this order, there were obtained from Columbus, Cincinnati, and other neighboring towns numerous medical and surgical supplies, including a large amount of drugs and other requisites. Four surgical operating rooms received several coats of white enamel paint, numerous pine examination booths were colored a dead black, a few floors were oiled and some of them covered with linoleum of various hues and their windows decorated with curtains. Unattractive floors were stained, and every necessary appliance that could be had was added to the previous scanty equipment.

This emergency equipment undoubtedly enabled the medico-military officials of the head surgery building of the base hospital and, to some extent, the heads of other services to do much effective work that either would have been impossible or further postponed until the necessarily tardy arrival of the government outfit.

[*Kitchen Waste and Garbage.*—These are now divided into four classes, sorted as such and sold to contractors. They consist of: (*a*) bones and fats; (*b*) other kitchen garbage; (*c*) cans, bottles, coffee grounds, etc.; (*d*) combustible waste.

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Manure is collected at a central point, sold to contractors, and loaded on freight cars.

The hospital heating plant consisted of eight boilers. No return system has yet (April, 1918) been installed. Steam and hot-water pipes are carried overhead, insulated. Pipes in the corridors were not covered until late in the winter of 1917 and the heating plant was inadequate. Oil stoves (over 100) were in use throughout the hospital. At one time the coal supply was deficient. One very cold night in February, $1,500 worth of radiators froze and burst.

Lighting.—Electricity was obtained from Chillicothe, Ohio, until November 1, 1917; since then from Columbus. The former supply was uncertain and unsatisfactory, but the latter is excellent.

Mess.—At first, patients, officers, detachment, and nurses all subsisted in what is now the patients' mess rooms. About a month later the messes were separated, a mess for officers, one for the detachment, one for the nurses, and one for patients being organized. In the near future the officers of the staff will organize a mess separate and distinct from that of the sick officers, whose mess quarters they occupied for several months.

The equipment for the patients' mess is excellent, adequate and modern. This mess has always been satisfactory. All supplies are brought to the main storeroom and distributed to the other messes as required. On January 1, 1918, the allowance for nurses and patients was changed from 40 cents per day to 60 cents, while the allowance for the detachment remained at 40 cents per day.

The *chapel* at Camp Sherman base hospital has been used for religious purposes; just as frequently, however, it is put to such secular uses as lectures, conferences and instruction classes of various kinds. Here the clinical society of the hospital first met.

The *hospital laundry* is not yet established. Hospital linen was washed by the Rothrock Laundry at Washington Court House, Ohio, until November 6, 1917, when the camp laundry took over the work; but it is not entirely satisfactory.

Hospital storehouses are four in number. Three are for medical supplies and one for quartermaster supplies. The buildings are 150 feet long and 24 feet wide, with heat and light. Medical supplies for the cantonment hospital, the organizations of the division, as well as for the veterinary and dental supplies for the division, are all kept in these buildings.

The Hospital Personnel.—At the following dates this consisted: October 18, 1917, 52 officers, 16 nurses, 298 enlisted personnel;

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April 10, 1918, 93 officers, 150 nurses, 513 enlisted personnel (including all conscientious objectors drafted and sent to Sherman).

Regimental Infirmaries.—The medical officers of the base hospital early encouraged friendly coöperation with the surgeons and assistant surgeons of the regimental hospitals, and the most cordial and sympathetic relations existed between these officials.

Autopsies.—The building arranged for post-mortem examinations was of standard size and arrangement. Two good-sized rooms with concrete floors, autopsy table, appliances for light, drainage, etc., were among the earliest of the constructions. Until about March 20, 1918, autopsies were done as a matter of routine in all cases unless some special reason prevented. Much interesting information was obtained, and the order preventing autopsies was a matter of considerable regret to all. Total number of autopsies to date, 59.

There has never been a proper *hospital exchange.* The one in existence is a part of the division exchange, run on the concessionaire system, and is of no appreciable advantage to the hospital.

There is as yet no Y. M. C. A. building attached to the hospital group, but one is under construction. An American Red Cross building will soon be erected on the grounds; the Knights of Columbus building, on May 13, 1918, was nearly finished.

There are no *amusements or recreations* except games, periodicals, etc. The camp library has a branch in the Post Exchange Building. Patients play baseball and "throw horseshoes" on grounds.

Physical examination of drafted men is made by regimental surgeons. Specialists at base hospital pass on cases for discharge. All these men were sent to hospital for this examination in the first draft. The second draft, arriving late in March, 1918, were examined in barracks and specialists from the base hospital went to them at stated hours during the day.

Vaccinations were given by regimental surgeons at the regimental infirmaries immediately after arrival in camp.

Conscientious Objectors.—In several sections of Pennsylvania and throughout Ohio there are colonies of Mennonites as well as bodies of Quakers—perhaps half a dozen varieties of the former and several classes of the latter—widely differing in religious beliefs and in their attitude towards this war. Representatives of all these sects (opposed to taking part in the great conflict and making a most difficult problem for the military authorities and the Federal

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Government) were drafted to the number of about one hundred and were for a time part of the Depot Brigade. Eventually they were transferred to the base hospital in the belief that they might serve as cooks, orderlies and in other non-combatant capacities. The pure Quaker element and the educated Mennonites raised no objection to this proposal, but about forty-five of the ignorant, illiterate and fanatical Mennonites, especially the Ammish sectaries, refused point-blank to do any work whatever about the camp or hospital. In this decision they were backed and likely prompted by their leaders and "bishops," who visited them frequently.

Alien Enemies.—Quite illegally, some 2,000 aliens (citizens of Austria, Bulgaria, Germany, etc.) were included in the draft and sent to Camp Sherman. These were mostly ignorant miners who could not speak or write English. Some of them, however, had seen military service in their own country and a few were of the superior mechanic class. During a dearth of enlisted men for the miscellaneous service of the base hospital, Majors Wood and Morris were ordered by the commanding officer to inspect these men (of the Depot Brigade) with a view to their transfer to the hospital service. In spite of the dark prognostications of many, the 125 men thus chosen to do duty (of their own free will) in the hospital proved to be, almost without exception, useful, faithful and competent cooks, orderlies, wardmasters, etc., comparing favorably with other enlisted men. They felt they were really Americans and owed the country something in spite of their foreign birth and citizenship.

Epidemic and Isolation Wards.—These were numbered 33, 34 and 35, 33 being the first one opened (about September 24, 1917) under the care of Capt. E. E. Adel. On September 28, 1917, there was in them only one case of chicken-pox and one of diphtheria. Between September 28 and November 5, 1917, nineteen cases of mumps, two of diphtheria, one of probable variola, two of scarlatina and one of varicella were admitted. On or about November 3, an epidemic of Koch-Weeks conjunctivitis ("pink-eye") broke out in a number of the organizations of Camp Sherman and in the vicinity, but especially among the men of the infantry regiments, so that within a month there were probably 1,500 cases of this very contagious disease. This state of affairs necessitated the use of ward 35, where most of the menacing cases were interned and treated.

Since then we have had the usual sporadic cases of cerebrospinal meningitis, but nothing that could by any stretch of the imagination be termed an epidemic; and fewer cases than in the other canton-

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ment hospitals. On the other hand, the camp was visited by average epidemics of measles, mumps, scarlet fever and pneumonia. (See the account of the medical service.)

Notes on the Surgical Service.—While the hospital was occupying temporary quarters in barracks, Section B, the upper floor of the building was used for mixed surgical and medical cases. The surgical cases were under the care of 1st Lieut. George M. Logan and 1st Lieut. Ralph B. Thompson, who were at once assigned as the nucleus of the surgical staff. Some minor surgical operations had been performed under local anesthetics before this time.

The first work of organization was the separation of the surgical from the medical cases, and although they were all confined to the upper floor of the single barrack, they were so grouped that certain parts of the floor were designated for the different services.

About sixteen to twenty cases were the average hospitalized at this time. About September 9, 1917, Captain Barnett arrived and was assigned to the genito-urinary service. On the same day the surgical staff fitted up, on the corner of the lower floor of the building, a temporary operating room.

The class of cases assigned to the surgical service were at first largely infections arising from "shoe abrasions of the feet and ankles," carbuncles, cellulitis, furuncles from or following vaccine treatments, of which there were a few.

On account of the temporary character of the location, severe accidents and grave conditions were not at that time retained, but were, if possible, sent to Columbus Barracks Hospital by train.

On September 12, 1917, the first central disability board was appointed by Colonel DeWitt, made up as follows: Capt. James A. Harvey, president; Captain Barnett, and Lieutenant Effler, registrar. A few cases were passed upon for rejection as early as this date, the board being required occasionally to adjudicate others until later reorganized, when Lieutenant (now Captain) Gates took the place of Captain Barnett.

When on September 17, 1917, transfer of the entire staff and patients was made to the new base hospital, then only partly completed, a temporary operating room was fitted up in the kitchen of the officers' ward building. With the aid of carpenter recruits, pine operating tables, shelves, etc., were made and the necessary emergency equipment, consisting of one field hospital set of instruments, was installed. Sterilizing was laboriously performed over a single alcohol flame, requiring much time and patience. In this room on September 21, 1917, was performed the first major surgical opera-

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tion done in the base hospital. Pvt. Harry Davis, Battery E, 322nd F. A., was operated on for acute appendicitis by Capt. James A. Harvey.

The first dental operation under general anesthesia was performed by 1st Lieutenant Hannon, D. R. C., on September 22, 1917, 1st Lieut. R. B. Thompson administering chloroform.

The first mastoid operation was performed by Maj. Christian R. Holmes in September, 1917.

The surgical staff at this time consisted of Capt. James A. Harvey, chief surgeon; 1st Lieut. George M. Logan, 1st Lieut. Ralph B. Thompson, and 1st Lieutenant Gates.

Subsequently the new operating pavilion was fitted up and, with its two operating rooms, was used for all the general surgery. New members were gradually added to the staff, and wards 1, 2, 3, 4, 5 and 6 were occupied by the following cases: Ward 1, suppurating and infected cases; wards 2 and 3, acute surgical cases; ward 4, fractures; ward 5, disabled and waiting cases; ward 6, orthopedic cases.

On October 1, 1917, the staff and department were completely organized and at work on a system similar to that followed by the better grade of metropolitan hospitals: Maj. James A. Harvey, surgical chief; Capt. C. W. Hoyt, orthopedic surgeon; 1st Lieut. George M. Logan, operating ward surgeon; 1st Lieut. Ralph B. Thompson, operating ward surgeon; 1st Lieut. Clark E. Sharp, anesthetist; 1st Lieut. Williams G. Gates, operating ward surgeon; 1st Lieut. J. D. Wakefield, assistant ward surgeon; 1st Lieut. C. S. Jackson, assistant ward surgeon. Sixty-seven major and minor operations were performed between October 1 and 26, fifty-three of these under general anesthesia.

During this month Maj. N. M. Black, representing the Division of Head Surgery, and Major Ridlon, orthopedist, visited the hospital for the purpose of conferring with the members of the staff.

On September 26, 1917, Captain Harvey was commissioned major, M. R. C., and designated Chief of the Division of Brain Surgery and General Surgery of the Base Hospital. During October, 1917, the following new members were added to the surgical staff: H. M. Hosmer, Major, M. R. C., as assistant to Major Harvey in administrative and operative work; Louis I. Mason, Major, M. R. C., with same assignment; Capt. H. L. Shelling, Capt. R. A. Noble, 1st Lieut. G. Delote, 1st Lieut. R. E. Kleckner.

About one hundred operations were performed during this month.

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The report submitted at this date stated that the department was oversupplied with efficient surgical officers, but as it was the custom to "rotate" the members of the staff weekly, each member with the commission of captain or above received training and became perfectly familiar with every part of the surgical service, clinical and administrative, and could act in the capacity of chief should occasion require. Each member of the staff was given, in addition to his usual duties, a special assignment or detail to work out, such as asepsis and surgical technique, orthopedic appliances, Carrel-Dakin treatments, modern treatment of burns, anesthetics, autopsy reports, report on case histories, etc.

Surgical conferences were held daily at 6.15 p. m. by the surgical chief and his staff. On these occasions matters of staff interest were discussed and short papers read upon surgical subjects of general importance. Instruction was also given in orthopedics.

The subdivision of brain and head surgery about this time was made, the surgical staff consisting of Maj. James A. Harvey, Capt. R. Noble and Lieut. G. Belote. A department of surgical technique and animal surgery was also established, and under Captain Noble much operative work with anesthesia was carried out under the direction of this surgeon by various junior members of the staff. This department was used as instruction courses for field hospital officers as well.

One hundred and thirty operations, major and minor, were performed between November 26 and December 31, 1917. The surgical staff at that time consisted of fifteen surgeons; 1st Lieutenant Knudson, 1st Lieutenant De Tuncq, Captain Ray, Lieutenant Eby, and Lieutenant Marshall were added to the staff.

The report at this time states: (1) The surgical service at the base hospital is most fully and thoroughly equipped with a modern and complete armamentarium. Operating rooms can be used simultoneously and effective service is rendered. A good cystoscopic room has been installed and sterilizing is done for other services of the hospital. (2) The chief of service operates on alternate days, using as assistants the ward surgeons, leaving the other day open for other operating surgeons and their ward assistants. (3) The majority of the surgical staff is made up of mature and experienced surgeons. (4) Surgical staff conferences are held at the end of each day and are proving to be invaluable. Details of the work are discussed and plans for improvement formulated. (5) Eight men detailed from the field hospitals are instructed daily in anesthetics

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and in the commoner surgical procedures. (6) Experimental and technical surgery is demonstrated upon animals. (7) Instruction is carried out by clinical demonstrations in wards and at staff meetings one night weekly for all medical officers of the division. Daily instruction is given to a class of twelve junior medical officers by means of lectures and surgical demonstrations.

On January 10, 1917, Maj. James A. Harvey was ordered to proceed to Camp Greenleaf, Fort Oglethorpe, Ga., for service, and was assigned as chief operating surgeon, Evacuation Hospital No. 5.

(To be concluded)

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THE TREATMENT OF INFECTIONS AND INFECTED WOUNDS WITH DICHLORAMINE-T

By Capt. W. E. LEE, M. C., and Capt. W. H. FURNESS, M. C.

INTRODUCTION

THE uniformly disastrous results, during the early months of the war, which followed the attempts to close gunshot wounds at the time of the primary operation, were the causes of a military order in 1915 prohibiting the practice. Virulent infections of gas gangrene, streptococci, pneumococci and other pathogenic organisms had invariably followed primary closure, and it was therefore ordered that all gunshot wounds should be left open. This, of course, ordained that practically every gunshot wound was to become an infected wound.

At the present time, we know authoritatively that the surgeons of one of the armies are routinely closing their wounds, when mechanically possible, at the time of the primary operation, just as they would civil wounds, and are obtaining primary union without infection in 85 to 90 per cent of the cases so treated.

This change in the attitude of the military surgeons from one in which they were forced, by their disastrous results, to condemn every wound to infection by leaving it open, to the present one in which they feel masters of the problem of infection in military wounds, as they have for many years in civil wounds, has developed very slowly and is the result of many contributing factors.

The first reaction of the surgeons, after their apparent failure to obtain clean wounds with aseptic surgery, was the search for and use of germicidal agents. Voluminous reports appeared in 1915 and 1916, and still continue to appear, of greatly improved results in the treatment of gunshot wounds with the use of many germicidal agents.

Wright's solutions, hyper and hypotonic salt, Dakin's and Daufresnés modification of Labarraque's solution, the chloramines, eusol, the salt packs, Eau de Javelle, the various synthetic dyes as flavine and brilliant green, quinine hydrochlorate, the paste of bismuth, iodoform and paraffine ("BIPP"), inoculations with the Reading bacillus as well as the old standard agents, such as carbolic acid, alcohol, ether, formaldehyde, iodine, hydrogen peroxide, and last, and least, the simple use of soap and water, have all received favorable reports.

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We had the privilege of seeing the end results obtained by the men working with these germicidal agents upon patients as they finally reached a base hospital in France, and by the time of the Somme offensive, the improved condition of the wounds, when they reached the rear, was certainly very definite. Where in the battle of the Champagne 80 per cent of our cases contained the gas organism in the wounds when cultured and 60 per cent had the clinical symptoms, in the battle of the Somme but 20 per cent had gas on culture and only 5 per cent showed the clinical symptoms. Our mortality in 1915 was 4.6 per cent, while in 1916 it was only 1.9 per cent.

But the fact that this improvement was not confined to wounds treated with any one germicide suggested that at least other factors might be equally important.

During the period of this development of antiseptics (1915 and the first half of 1916) far greater changes had taken place in the organization of the armies, so that in the battle of the Somme the French wounded we received at the base hospital had had their primary operations on an average of 6 hours after the receipt of their injuries instead of from 5 to 7 days, as was often the case in the battle of the Champagne. Further, this reorganization of the medical service had not only made possible such prompt operations, but it had also so equipped these surgeons that the primary operations were thorough. Removal of over 90 per cent of the foreign bodies and the routine free incision of all wounds, with wide excision of dead and devitalized tissues, had been practiced in all of our cases. These last two factors were uniform in the primary treatment our patients had received in the Battle of the Somme, though the germicides that had been used varied a great deal.

We had seen in the latter part of 1915, at Compiegne and La Panne, just such wounds as we received from the Somme. Both of these hospitals were quite near the firing line, and their wounded were received and operated upon frequently within one to two hours after their injury. In these hospitals, Carrel, Dehelly and Depage were using a uniform technique which consisted in operating at the earliest possible opportunity and of the aseptic removal of all foreign bodies and devitalized tissues. This was followed by a chemical sterilization of the wound with Dakin's solution of hypochlorite. Here, again, early operation and removal of foreign bodies and dead tissues were the common factors.

Since the battle of the Somme comprehensive reports have been published of the use of almost innumerable antiseptic agents and

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by Gross, of the use of no antiseptic. Sir Berkeley Moynihan suggested this heresy during his recent visit to America. Upon careful analysis of these apparently conflicting reports, we find that only in those cases where early operation, within three hours, and the aseptic surgical removal of foreign bodies and dead tissues have been practiced, do the results approach those reported by Carrel, Dehelly, Depage and Chutro.

The general opinion of military surgeons at the present time is that the interval of time elapsing between the injury and the operation, together with the thoroughness with which the foreign bodies and dead tissues are removed, are the vital factors in the problem of infection in military wounds.

From our previous experience in civil surgery we should have appreciated long before we did that the incidence and virulence of infection in wounds increase with the delayed surgical treatment. That the wounds received in industrial accidents are not virulently infected we feel is a misinterpretation of facts. We have recently had the opportunity, at the Pennsylvania Hospital, of comparing the time required for the treatment of a group of industrial cases and a group of ordinary dispensary cases. When exactly the same treatment (dichloramine-T) was used in both groups, and when it had been applied within a half hour after the receipt of the injury, the industrial cases required on an average 10.4 days for recovery and the civil cases 6.5 days. The mechanical injuries in the industrial group were of course more severe than in the civil group. But when these civil cases did not receive the treatment within the first half hour, but on an average of 6 days after the injury, their period of recovery was 28.6 days. It is because the industrial surgeons, with their elaborate "first aid" organizations, give the primary treatment far more promptly than it is received in any other class of wounds, that they obtain such good results.

Traumatic infection of tissues is at first confined to the exposed surfaces. In military wounds it is often at first definitely localized to the foreign body; in about 50 per cent of cases the missiles are infected, and the clothing always. Usually, these organisms are spreading from the foreign body and advancing over the adjacent surface of the wound for some hours, and during that period, approximately within 3 hours, it is possible to remove mechanically the source of infection and the infected surface of the wound. This explains the more or less uniform results obtained by surgeons

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employing various germicides, also early operation with removal of foreign bodies and the infected surfaces of the wound.

Though the necessity for prompt operation and thorough removal of foreign bodies in traumatic wounds was known by civil surgeons before the war, the extent of the devitalization of the adjacent tissues in gunshot wounds was not understood until quite recently. The area of devitilization in traumatic wounds of civil practice rarely extends more than a quarter of an inch beyond the surfaces of the wound. In military wounds, where the velocity, and often the weight of the missile, is enormously greater than in civil wounds, this area of dead tissues is increased many times. Further, not only does the rapidly moving missile destroy tissue, but every solid body it touches—bone, cartilage—receives momentum from it and becomes itself a secondary missile, and in turn rends and tears. With its circulation destroyed, such tissue must die and, when dead, it serves as an ideal culture medium for pyogenic bacteria. It is in dead muscle tissues only that the gas bacillus of Welch can grow.

Thus it is that Moynihan and Crile, during their recent visit to this country, have called attention to the necessity for surgical, not chemical, removal of this extensive area of devitalized tissues in military wounds, and have emphasized the fact that this is undoubtedly of far greater importance in the primary treatment of these wounds than is the use of any antiseptic. Those acquainted with the work of Carrel, Dehelly and Depage will appreciate that, in addition to the use of the hypochlorite solution, they practice the most careful and thorough resection of the devitalized tissues.

It may seem unnecessary to suggest that the increased virulence of infection in the military wounds is probably in direct proportion to this increased area of dead and devitalized tissues. But on the other hand it seems reasonable to assume that if it is surgically possible to remove entirely this unusual factor of dead tissue from military wounds, then theoretically we should expect the tissues to heal as they do in civil surgery. This is at least the hope that Moynihan and Crile place before us, and the recent results we have reported would seem to demonstrate the possibility.

This introduction to our report on antiseptics has been inserted in order to insure a presentation of them in their true value, and we again take this opportunity of reiterating the concluding paragraph of our first report upon the use of dichloramine-T in the treatment of infections and infected wounds:[1]

[1] Dakin, Lee et al., Transact, American Surg. Assoc., 1917.

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One should not depend on a chemical agent to perform, in the prevention and treatment of suppuration in wounds, that which can and should be done quickly and thoroughly by mechanical means. Neither chemistry nor bacteriology can or should be expected to replace the mechanics of surgery. At the best, these chemical germicides can react only on the bacteria with which they actually come in contact, which means a very superficial process. Therefore, at the primary operation all foci of infection and devitalized tissues must be removed when possible by surgical procedures. Finally, adequate drainage, dependent if indicated, must be provided.

The most important factors in the prevention of infection are:

1. Surgical treatment at earliest possible moment.
2. Removal of foreign bodies.
3. The complete removal of devitalized tissue.
4. The use of such a germicide as will not delay by its application the time of the closure of the wound.
5. The closure of the wounds when the foregoing has been practiced.

When it is not possible to prevent infection by the practice of these principles another problem is presented, that is, the control of the infection. Here the surgical principles of early operation, removal of foreign bodies and dead tissues, and dependent drainage should be followed, but the use of an antiseptic will in our experience greatly aid in the control of infection.

Dunham[2] has demonstrated that three conditions govern the degree of success that can be obtained in disinfection by the use of germicidal agents.

1. Actual *contact* of the germicide with the infecting organisms.
2. The maintenance of such contact for a sufficient length of *time*. This should be continuous if possible.
3. An adequate *mass* or concentration of the agent at the points of contact.

Contact is essentially a mechanical problem and the surgeon can place no dependence on the power of penetration of any known germicide.

Time and *mass* cannot be dismissed in such general terms.

The *time* during which contact can or should be maintained depends upon:

1. The *speed* or rate of disinfection of the agent employed.
2. The *stability* of the agent under the conditions of its use.

[2]Dunham, Surg. Gyn. Obs., Feb., 1918, pp. 152-159.

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This, of course, directly affects the period over which one application will act.

The *mass* is determined by the permissible concentration that can be employed. This concentration is governed chiefly by the degree of irritation occasioned by the agent, especially upon the skin and mucous membranes, as these are more susceptible than the deeper tissues.

The experience of the surgeons for nearly two and a half years at the hospital of the American Ambulance in Paris has been in accord with that of the majority of surgeons who have served in the present war, namely, that the chlorine preparations have proven superior to all other germicidal agents,[3] the most successful of which was that of Dakin, a very dilute, neutral, Labarraque's solution.

This neutral hypochlorite solution was found to have three inherent faults.

1. The neutral solution, unlike the original Labarraque's with its free alkali, was very unstable and it was necessary to prepare it almost daily.

2. The dilute 0.48 per cent solution contained such a very small mass of germicide, if the concentration were even slightly lowered, *e. g.*, to 0.4 per cent, the germicidal efficiency was very materially impaired, that it was necessary, in order to obtain a maximum effect, to have the solution at all times in contact with the surface of the wound.

3. The active chlorine was used up so rapidly from the solution when it came in contact with the wound exudate, from seven to fifteen minutes as estimated by Carrel, that it was necessary to

[3]It is really revolutionary, from a laboratory point of view, that chlorine should be found to be applicable, in any form, in the treatment of infected wounds, for chlorine is a general disinfectant and as such it is to be expected that it would be a general protoplasmic poison fully as destructive to the tissues as to the bacteria. It is an agent which destroys everything with which it comes in contact unless very carefully controlled, and, before Dakin developed his unique method of control, decidedly unfortunate results followed the attempts to use such standard preparations as Eau de Javelle and Labarraque's solutions.

Dakin, while experimenting at Campiegne in 1914, found that a very dilute Labarraque's solution, containing no more than 0.5 per cent of hypochlorite, would not destroy the living animal cells in the tissues of the wound. The germicidal value of such a weak solution was, of course, very far from that required to destroy the massive infections in gunshot wounds, but he suggested that the same principle of fractional sterilization which has for years given satisfactory results in the sterilization of surgical dressing material by heat, could be employed for the sterilization of infected tissues with this weak chlorine solution. Organisms, whose spores require for their destruction a degree of heat which would also destroy the fabric to be sterilized, are completely killed by several exposures, at intervals of forty-eight hours, to temperatures which do not injure the fabric but which are far below the lethal requirements of the bacteria.

Dakin found that by applying this dilute neutral Labarraque's solution every two hours *a progressive fractional sterilization* was accomplished in infected wounds without any of the tissue destruction which had limited the use of the stronger standard chlorine preparations.

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frequently renew the supply of germicide, at least every two hours, night and day.

Carrel and Dehelly developed a system of reservoirs and rubber tubes by means of which an intermittent instillation of this weak chlorine solution was made possible.

It is generally conceded that it has been demonstrated conclusively:

First, that if infected wounds are treated with the same aseptic surgical care that surgeons give to clean wounds, very unusual results can be obtained.

Second, that the primary dressing of infections and infected wounds should be made a formal aseptic operation in which all devitalized and infected tissue that it is mechanically practical and automatically justifiable to sacrifice, should be removed, with knife, forceps and scissors.

Third, that infected wounds so treated can be sterilized if the wound surfaces are constantly bathed with even such a small mass of germicide as is contained in the aqueous hypochlorite solutions. This constant immersion can be accomplished by the Carrel-Dehelly hydraulic system of reservoirs and tubes.

Fourth, that when the wound surfaces are practically clean, one bacterium per five microscopic fields for three successive counts made every third day, the wound edges may be approximated by sutures and union may be expected to take place without infection in about 80 per cent of the cases.

Many have had the privilege of seeing the work of Carrel and Depage and can personally testify to the accuracy of their claims, but the indifferent success most of us have had in trying to obtain similar results, Carrel himself says, is because of our failure to grasp and apply the details of the technique. The Carrel technique demands an unusual degree of painstaking and time-consuming care, not peculiar skill, upon the part of the surgeons, nurses and chemist; and the unusual expense for both the apparatus and dressing material develops difficult problems for the entire personnel of even our civil hospitals.

Further it is essential in this technique of Carrel so to prepare the wounds at the primary operation that they will act as basins for retaining the hypochlorite solution during the period of repair. Thus the cardinal principle of surgery, dependent drainage of infected cavities, must be abandoned if this treatment is to be used. In spite of this, if the wounds are subsequently treated with the

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aqueous hypochlorites with the infinite care Carrel practices, the results will be far better than with any other treatment we have used in the past. But, if for any reason this perfect hydraulic system breaks down, and it is very vulnerable, these wounds prepared in this way act as pus pockets, and, as has been expressed by many military and civil surgeons, such wounds give unfortunate results.

We must not forget, in our admiration for the Carrel technique, that it was because of the severe skin irritation produced by the standard hypochlorite preparations that Dakin first suggested his modified Labarraque's solution; and that because of the inherent faults of this Dakin's solution, instability, the very small mass of germicide contained, and the rapidity with which it liberated its chlorine, it was necessary to develop an unusual technique to make such a solution effective in the treatment of infected wounds.

Or this might be stated in another way, that the Dakin's solution and Carrel technique represent an effort to modify Labarraque's solution and the method of its application to infected wounds in such a way that there will be a minimum of the dreaded skin irritation produced by the original Labarraque formula.

The unusual mechanical and economic conditions required, together with the annoying skin irritation which still too frequently followed the *progressive fractional sterilization of wounds* with weak chlorine solutions, prompted Dakin to further experimentation. The fact that the irritation following the use of this solution was confined to the skin, and never occurred in the wounds, resulted in his examining the chemical changes which occurred when chlorine solutions were applied to wounds. He found that aqueous solutions of the hypochlorites, when in contact with the proteins of the wound exudate, split the proteins, the amino group of which (NH_2) would then unite with the active chlorine of the hypochlorite solution to form substances which are known chemically as chloramines. The rapidity with which this chemical process takes place in the wounds, five to seven minutes, means that the irritating free chlorine of Dakin's solution is present in the wound but a few moments every two hours in the method of *progressive fractional* sterilization, while, if the chlorine comes in contact with the surrounding skin, free from protein or anything else to modify or neutralize it, the dreaded phenomenon of chlorine irritation is pro-

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duced. Dakin found that these chloramines were nonirritating to the skin as well as the wounds.[4]

In 1905, Chattaway[5] had made chloramines synthetically and described them as a chemical curiosity, but had no knowledge of their germicidal value. Dakin found that they had a very definite germicidal action, and it is now his belief that the germicidal effect of all chlorine preparations in infected wounds depends upon the action of the chloramines which they produce in the wounds and not upon the chlorine itself.

The next step was perfectly obvious. If the acting germicidal agent is a nonirritating chloramine and chloramines can be made synthetically, it should be possible to use synthetic chloramines in the treatment of infections and thus avoid entirely the skin irritation encountered when chlorine solutions are used to produce chloramines in the wound, even when as carefully controlled as by such an accurate method as that of *progressive fractional sterilization.*

The first synthetic chloramine to be used by Dakin was a sodium salt of toluene-para-sulphon-chloramide or, as he called it, chloramine-T. This synthetic chloramine was nonirritating to the skin and wounds and was used in aqueous solutions of from 2 to 4 per cent to produce a *progressive fractional sterilization* of infected wounds by some such hydraulic system as devised by Carrel and Dehelly.

The problem in the sterilization of the naso-pharynx, of disease carriers, in which Dakin was next engaged, did not present such favorable conditions for *progressive fractional sterilization* as was found in wounds. It was difficult to devise a method that would keep aqueous solutions at all times in contact with the vertical surfaces of the nasopharynx, and the constant to-and-fro passage of air currents over these surfaces caused all watery solutions to evaporate rapidly. It was desirable to have a solvent which would carry a large mass of germicide and that would hold it so firmly in solution that it would be slowly diffused into the surrounding tissues for the greater part of 24 hours. Oils were experimented with and finally a chlorinated eucalyptol was used as a solvent for a dichloramine (chloramine-T being only soluble in water).

Dichloramine-T has been found to be a germicide which possesses to an unusual degree the properties that make it possible to

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[4]Dakin and Dunham, Handbook of Antiseptics.
[5]Journ. Chem. Soc., London, 1905, lxxxvii (1), 145.

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meet the conditions which Dunham says govern the success of disinfection: *Contact, time, mass.*

The irritation which accompanies the application of most germicides, limiting their use and governing their permissible concentration, is negligible with dichloramine-T. Dichloramine-T can be used in solutions as strong as 10 per cent. The germicidal *mass* of such a solution is 40 times that produced in wounds by a 0.5 per cent solution of hypochlorite.

Because of its peculiar stability in oil solutions and unusual speed of disinfection, the required *time* of contact with the infecting organisms is readily maintained. Under average conditions its germicidal activity lasts about 18 hours in contrast to the 30 to 60 minutes of Dakin's hypochlorite solution. This *stability* of the oil solutions of dichloramine-T in infected wounds of course will vary with—

1. The quantity of germicide used.
2. The surface area of the wound.
3. The mass of infection.
4. The amount of exudate.

Dakin and Dunham[6] in their investigations upon the *speed* with which disinfectants act, have shown that there is a wide divergence. Eliminating the influence of varying media, which is very important, by employing constant media (blood serum and muscle extract), they have shown that dichloramine-T, in a 2 per cent solution, acts with a speed 8 times that of Dakin's hypochlorite, 800 times that of a 1 to 1,000 solution of bichloride of mercury and at least 2,880 times that of a 2 per cent solution of carbolic acid.

Dakin entrusted to Major Sweet and Captain Lee the development of a method of obtaining the necessary *contact* of the agent with the infecting organisms.

At the time this clinical test of the use of dichloramine-T in chlorinated eucalyptol was started it was generally believed that disinfectants in oils were useless, and, curiously, this view is still maintained by a few. This idea was based on an observation by Koch, who found that carbolic acid, a strong germicide in water, was much reduced in activity by solution in vegetable oils. These experiments were used as a basis for the generalization that disinfectants in oil were quite useless. The work with dichloramine-T has shown that this generalization is incorrect and that oily solutions can be expected, not only in the instance of dichloramine-T, but in

[6] Dunham, Surg. Gyn. Obs., Feb., 1918, pp. 152-159.

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other instances, to do a great deal that water solutions will not do. Observations by Richards and McMaster have shown that carbolic acid is less active as a disinfectant if dissolved in water than in mineral oil. The whole question of disinfectants which are soluble in oil will have to be gone over again.

At the present time records have been obtained from 19,040 completed cases in civil surgical practice which have been treated with dichloramine-T during the last fifteen months. These cases have been treated in the Pennsylvania, the University of Pennsylvania, Germantown, Children's and Bryn Mawr hospitals and the accident services of the Midvale Steel Works and the Remington Arms Company, Dr. Robert P. Cummings and Dr. George B. Sickel having been in charge at the latter places.

After these fifteen months' investigation we feel:

1. That the use of dichloramine-T has definitely improved the results we have obtained in the primary closure of traumatic wounds of the soft tissues, bones and joints.

2. That in the treatment of superficial accessible infections dichloramine-T has uniformly given us better results than any other germicide we have employed, and that the method of its application is simpler and the dressings more economical than with any of the other chlorine agents.

3. That the best results with dichloramine-T can only be obtained when actual chemical contact of the germicide with the infecting organism is maintained.

4. To maintain such contact in superficial surgical infections is a simple matter, and in the first few months of the work a satisfactory technique for this class of wounds was developed. In deep and inaccessible infections the problem is more difficult, and the greater part of the fifteen months has been devoted to this aspect.

5. Our confidence in the germicidal value of dichloramine-T has so developed that when it does not control infection we feel that the chemical contact has not been maintained, the mass of the germicide employed has not been sufficient, or adequate surgical treatment has not been given.

6. The striking detoxicating effect of the chlorine group of agents which has become common knowledge through the general use of Dakin's hypochlorite solution is just as satisfactorily exhibited with dichloramine-T.

7. Dichloramine, unlike the aqueous hypochlorite solution, has no effect upon the knots of catgut ligatures and no disintegrating

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effect upon the catgut itself. The occurrence of secondary hemorrhages in wounds treated by the Carrel method was not uncommon in our experience at the American Ambulance. Major Sweet reports that, in his 1,200 cases of major infected military wounds, there was not one secondary hemorrhage.

8. Too great stress cannot be laid upon the value of dichloramine as a deodorant dressing. The absence of the usual disagreeable odors in our wards, containing cases with fecal fistulae, is a general observation. During the last two months, it has been used routinely in the wards of the Oncological Hospital in Philadelphia. Where formerly these putrid, sloughing, malignant tissues were irrigated every two hours with all kinds of solutions, with indifferent success in the control of infection and with a persistence of the offensive odor, now they are packed lightly every six hours with gauze saturated with a 5 per cent solution of dichloramine-T. Dr. Gordon Saxon reports that not only has the odor disappeared entirely, but the wound infections have been controlled.

TECHNIQUE FOR THE USE OF DICHLORAMINE-T IN THE PREVENTION OF SUPPURATION IN TRAUMATIC WOUNDS AND THE TREATMENT OF SURGICAL INFECTIONS

Accepting the results of the work of Carrel and Dehelly at Compiegne, Depage at La Panne, and of the large majority of military surgeons in the present war as demonstrating conclusively that infections and infected wounds must be treated with the same surgical asepsis as one follows in the care of sterile wounds, we make of each primary dressing a formal aseptic operation. This means the usual wearing of sterile gowns, rubber gloves, and the use of sterile instruments and dressing materials for handling the tissues. Further, we have consistently followed this same aseptic technique in the care of the wounds during the entire period of treatment.

The preparation for and the technique of the *primary dressing* should be that of an aseptic surgical operation.

The same rigid aseptic technique at each *subsequent dressing* of the wound is made possible by the arrangement of the dressing table or tray and the training of the nurse and assistant.

Before beginning the ward dressings or the dispensary treatments the surgeon thoroughly scrubs his hands with soap and water, and puts on a sterile gown and rubber gloves. The outer or retaining dressings and bandages are removed by the patient in the dispensary and by the nurse in the ward cases. The surgeon

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then removes with sterile thumb forceps or hemostats the thin layers of gauze directly over the wounds, and the light packing of gauze that is sometimes placed in the wounds. These forceps are then discarded and placed in a separate tray provided for soiled instruments and should be resterilized; they have come in contact with contaminated dressing and should not be allowed to come in contact with the wound or clean dressing material. With another pair of sterile forceps, cotton pledgets or gauze strips are held, in the cleaning of the skin. If the surface of the wound is to be cleaned with gauze, another clean pair of forceps must be used. If the wound is to be sprayed with the oil, the nurse manipulates the atomizer which cannot be sterilized. The sterile syringe, pipettes or applicators for introducing the oil are arranged in appropriate cups on the table or tray, and can be handled by the surgeon. The cotton tipped wooden applicators are used but once and then discarded. The glass pipettes are boiled after each contact with the wound. The syringe, only coming in contact with the sterile rubber-gloved hands of the surgeon and the germicide, is boiled after definite soiling. With a clean pair of forceps the sterile dressings are picked up and placed on the wound and retained with a light bandage, adhesive strips, or towels applied by the nurse or assistant.

The nurse during the above procedures is constantly placing the soiled instruments into the portable sterilizer on the table, where they are allowed to boil for five minutes, after which she returns them to the tray provided for the sterile instruments. In this way a constant progression of the instruments takes place from the sterile tray, to the surgeon's hands, to the tray for the soiled instruments, to the sterilizer, and back again to the sterile tray. The sterilization of the instruments by the nurse is concurrent with the dressing of the wound by the surgeon. The surgeon should never touch anything with his gloved hands except the sterile instruments, and all examinations requiring the touching, pressing or manipulations of the tissues are made only with the sterile instruments. Instruments which have touched the skin should never be introduced into the wounds. With such a method the surgeon can dress any number of cases without changing gloves.

The primary surgical treatment of traumatic wounds will depend upon:

1. The interval of time which has elapsed since the receipt of the injury.

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2. The character of the force causing the injury, cutting, lacerating, crushing or explosive.

3. The presence or absence of foreign bodies within the tissues.

4. The character of the infection which has been carried into the tissues.

Primary suture of traumatic wounds should be tried in the first three hours, and can be attempted as late as 12 hours after the injury. All cases of primary suture should remain under the personal observation of the operating surgeon for at least 12 days following the operation.

The character of the force causing the injury is of vital importance, because it directly determines the area and degree of devitalized tissue that will be found in the wound.

The presence of foreign bodies in the wound signifies not only foci of infection, but a greater degree of devitalization than results from a purely external force.

The probable character of the infection that may have been carried into the wound must be carefully considered. The possibility of contamination with human or animal excretions always requires the giving of a prophylactic dose of antitetanic serum. If all devitalized tissue has been removed from the wound, the danger of the dvelopment of the gas bacillus will be eliminated. The presence of the streptococcus in recent wounds is rare, but when it is demonstrated by smear or culture many military surgeons will not attempt primary suture and prefer delayed primary suture after one or two days of chemical sterilization with a germicide.

Treatment of Infections.—The focus of infection should be excised when mechanically practical, or, in any event, widely exposed so that the germicide may have an opportunity for a complete chemical contact with the bacteria. An infection treated by a too large incision is a surgical rarity. Adequate drainage should always be provided according to accepted surgical principles. After the completion of the mechanical procedures, the wound surfaces are thoroughly covered with the 5 per cent solution of dichloramine-T. Wide-meshed paraffined gauze folded crosswise is then carried to the deepest portion of the wound, everywhere covering the raw surface. The wound edges are held apart by a generous gauze pack saturated with the same strength of oil, which is placed between the surfaces of the paraffined net and into the angle of its fold. A very light gauze dressing is then applied—not more than four layers. If the patient must remain in bed, a clothing cradle is placed over

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the wounded area to avoid displacement of the dressing. If the patient be ambulatory, the fewest possible turns of a lightly applied gauze bandage, or adhesive strips placed over the edges of the dressing and not across the wound, may be used to keep the dressings in place. Care is always taken in applying dressings that they shall not be impervious to the air; if eucalyptol is used as the solvent for the dichloramine-T it must be borne in mind that it is an essential oil and acts like all other essential oils when confined by air-tight dressings. We strongly advise against the use of eucalyptol.

With the use of chlorcosane (liquid parawax, chlorinated)—the solvent which we are now using and recommending—the indication for very light dressings is obviated. We have found, nevertheless, that more rapid and comfortable healing takes place with only a protective covering for the wound which permits the circulation of the air. If the discharge is unusual in quantity, fresh gauze may be reapplied during the day, but in our experience it is rarely necessary to renew the dressing more frequently than once in twenty-four hours. At the first dressing after the operation (and at all subsequent dressings) the same aseptic surgical technique is employed as at the time of the operation, and at this time the primary gauze drainage and paraffine net should be removed and no more reinserted, unless the walls of the cavity or sinus collapse in such a way as to make it impossible to introduce the oil. A 5 per cent solution of the oil is all that is required for secondary dressings, with the possible exception of massive infections, as in carbuncles or extensive bone lesions. Of course an opening in the surface of the wound must be maintained for the introduction of the oil until the infection is controlled.

Our first use of the dichloramine-T for *intra-abdominal infection* was limited to old, well walled-off sinuses following appendicial and tubal abscesses. The unusual rapidity with which these infections were controlled and the absence of any untoward symptoms gave to us the necessary confidence, and we now use it routinely at the time of operation in walled-off intra-abdominal abscesses in exactly the same manner as described, with superficial infections. In cases of gangrenous, perforated appendicitis with abscess, upon the removal of the appendix, the 5 per cent solution is dropped over all the visibly infected tissue. A medium-sized gauze drain (Mikulicz), saturated with the same strength of oil, is then packed into the cavity and the wound partially closed in the usual way. The following daily dressing consists in applying 2 or 3 c.c. of the same strength of oil to the gauze wick and upon the edges of the wound. After forty-

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eight hours the gauze wick is easily removed. About the fourth day, the drain is loosened and is removed when it has separated from the walls of the sinus; this is usually between the third and the seventh days.

It has been our experience that it is rarely necessary to replace gauze after the removal of the primary drain, but of course this may be necessary if the walls of the sinus collapse because of inadequate adhesions. The cavity of the wound is filled each day with the 5 per cent oil until it closes by granulation from the bottom. In none of the cases observed have there been any unfavorable symptoms, and the average time of complete closure has been fifteen days.

TREATMENT OF CARBUNCLES

With the patient preferably under a general anesthetic, deep crucial incisions are made through the carbuncle. These incisions extend beyond the area of infection at the periphery and down to the deep fascia. In only one case have we undercut each of the resulting triangular flaps and the necrosis of the skin at the apex of each flap in that case made secondary suture of the wound impossible.

Arterial bleeding is controlled by ligature and then from 1 to 4 small gauze tampons, saturated with a 5 per cent solution of dichloramine-T in chlorinated paraffine wax (chlorcosane) are firmly packed into the incisions after the raw surfaces have been covered with paraffine net as described in the treatment of infections, one in each limb of the starlike incisions in large carbuncles. Over this is placed a light gauze dressing, which is changed when soiled. These tampons of gauze and germicide are introduced with the object of bringing a large mass of germicide in contact with the exposed surface of the infection and at the same time of widely dilating the wound to insure at subsequent dressings the necessary access of the germicide to the infection.

At the end of twenty-four hours these tampons are removed. In carbuncles up to 2 inches in diameter it is rarely necessary to repack with gauze, but with the large ones several days of dilatation may be advisable. In areas under 1 inch the slough will have frequently separated during the first twenty-four hours; in large carbuncles it may require 10 days. At each daily dressing the 5 per cent solution of dichloramine-T is injected by means of a glass pipette and syringe into every accessible channel. In large carbuncles this may be done twice a day until the slough is separated.

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As soon as the slough has everywhere separated, a chart should be made of the bacterial content of the wound, and when the count remains as low as one in five fields for three successive days closure of the wound may be attempted. This secondary closure is not difficult if tried before the twelfth day, but after this, cicatricial tissue rapidly forms and more or less tension in the sutures is usually necessary to obtain approximation of the wound edges. Tension in the sutures is a frequent cause of reinfection and should always be avoided.

TREATMENT OF BURNS BY EXPOSURE TO THE AIR AND THE APPLICATION OF DICHLORAMINE-T THROUGH PARAFFINED MOSQUITO NETTING

Stewart's definition of an ideal dressing for severe burns is one "that would be (1) aseptic or (2) mildly antiseptic, (3) that would provide free drainage, (4) that would not macerate or (5) stick to the tissues and (6) would not necessitate frequent changing." Still another might be added, that (7) it should minimize the abnormal radiation of body heat from surfaces devoid of the protection of the skin and subcutaneous tissues.

We do not have at the present time any one method of treatment of burns in which all these conditions are attained. Wet dressings macerate and dry dressings stick. Ointments are not aseptic and cannot be used in concentrations strong enough to be antiseptic and, in addition to infecting the wounds, they form impervious coverings over the surfaces and prevent drainage of the secretions. Carron oil and all vegetable oils invariably infect the wounds and prevent drainage.

Ambrine and the many forms of paraffine films now used do meet some of the necessary conditions. They provide (1) an aseptic and probably (2) a slightly antiseptic dressing. Though at times painful when applied they do not stick (5) and can usually be painlessly and easily removed. (6) They do not require frequent changing. (7) They do, to a certain extent, act as insulating coverings and decrease the radiation of the body heat from the wound area. But (3) they are impervious dressings and are deliberately designed to prevent drainage. The object is to have complete retention of the accumulating wound discharges from one dressing to another. As a result (4) maceration of the tissues on the surface of the wound usually occurs.

The recent interest in paraffine film treatment has, for the time being, induced many surgeons to abandon a method, which had given excellent results, the exposure of the burned surfaces to

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the air. The open-air treatment of burns more clearly meets the theoretical requirements of an ideal dressing than any other that has been proposed. (4) Maceration does not occur. (5) There are no adherent dressings to remove. (6) The question of the frequency of the changing of dressings is reduced to the absolute minimum because no dressings are applied. (7) By keeping the patient under a canopy the temperature of the external air can be maintained at a body temperature and therefore there will be a minimum of radiation of body heat. Stearate of zinc powder was usually dusted over the surfaces to act as a drying powder but (2) no antiseptics were employed because of the irritation they invariably produced. Scabs rapidly formed under these conditions and, unfortunately, infected exudate would collect beneath them, necessitating their frequent removal. Thus (3) perfect drainage was not obtained. But the results were certainly as good as those following any other method while the small number of dressings required was appreciated by the patient, nurse and surgeon.

To this treatment of burns by exposure to the air we suggest the following modifications:

1. The covering of the entire burned area and a generous portion of the surrounding skin with a single layer of mosquito netting which has been previously impregnated with paraffine wax (see method of preparation). The paraffined netting may be held in place by single layers of a circular turn of gauze bandage or by adhesive strips applied over the netting and the uninjured skin (never over the burned area).

Such a dressing is (1) aseptic and the large open meshes provide (3) perfect drainage for the wound secretions to the outer surface of the netting. When this scab formation on the outer surface of the netting interferes in the slightest way with the drainage of the wound secretions, it is completely and painlessly removed by lifting the non-sticking paraffine net from the surface of the wound, usually once in twenty-four hours. The paraffined netting rarely adheres to the wound surface and then a generous spraying with sterile paraffine oil will always loosen it.

2. The only remaining condition to be met in order to have the air treatment fulfill all the requirements of the ideal dressing is the use of an antiseptic. We have found that a 1 or 2 per cent solution of dichloramine-T dissolved in chlorinated paraffine wax (after the method of preparation proposed by Dakin and Dunham) can be used on burned surfaces without causing any objectionable subjective or objective irritative phenomena. This oil solution can

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be readily applied in the form of a spray (at the room temperature no heating is required as with the paraffine films) and to the entire burned surface, before the paraffined net dressing is applied, and subsequently, through the meshes of the net on to the surface of the wound, if for any of the above mentioned reasons it is unnecessary to remove the dressing each day.

Just as satisfactory results are obtained in the treatment of small areas in which it is impracticable to confine the patient to bed. One or two thicknesses of sterile gauze are then placed upon the outer surface of the netting to absorb the excess of exudate.

We have employed this modified air treatment of burns at the Pennsylvania and Germantown Hospitals during the last twelve months. With it we feel that, because of the surprisingly small degree of infection occurring in these wounds, they have healed more promptly and with more satisfactory scars than with any other method heretofore used.

Preparation of the Paraffined Mosquito Netting used to Minimize the Sticking of the Dressings to and Permit the Drainage of the Discharges from the Surfaces of Wounds and Extensive Burns.

A good quality of mosquito netting with a 1/16 inch mesh is used, or fly netting 3/32-inch mesh. As purchased it is stiffened or "sized" and we have found this to be a decided advantage, for if the starch or "sizing" is removed by washing the thread will absorb too much of the paraffine and the mesh will be filled with wax, which prevents drainage. The netting is cut into strips, 4 by 6 inches being a convenient size, and 10 pieces are placed in muslin wrappers and a package made, as is done with gauze sponges. These packages are then sterilized in the usual way, steam under pressure of 15 pounds.

Paraffine wax—melting at 45°—ambrine, paresine, redintol or cerelene is then melted on a water bath in a flat agate tray. The tray should be about half filled with the melted paraffine. When the wax is thoroughly melted the previously sterilized netting, grasped at the two corners of one end by two sterile thumb forceps, is slowly drawn through the melted wax. The threads will quickly absorb the required amount of paraffine, in about one minute, and then the strip is held, by means of the same forceps, vertically over the hot surface of the melted paraffine until the excess of the wax has drained away and the mesh is everywhere open. The strip is then moved away from the hot tray and held

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for a few seconds in the air to cool, after which it is placed, in piles of ten, in sterile muslin wrappers as previously described.

Captain Furness has tested several combinations of paraffine and petrolatum, paraffine and liquid petrol, paraffine and beeswax and plain beeswax as to their solubility by dichloramine-T and chlorinated eucalyptol. In all combinations where petrolatum or liquid petrol or beeswax was used to make the paraffine flexible these substances were dissolved out of the wax and made the dressing not only soft, but rendered the paraffine thin and friable on the gauze. Pure paraffine, paresine, redintol and cerelene were unaffected by prolonged soaking in dichloramine-T.

TREATMENT OF INCISED WOUNDS

At the first opportunity a generous amount of a 5 per cent solution of dichloramine-T should be poured into the wound, and then the cavity should be filled with a gauze plug which has been saturated with the same solution.

After the completion of the usual preparations for an aseptic operation, the patient is given a general anesthetic except in the case of trivial wounds in which local anesthesia may be used.

The field of operation is prepared by a mechanical cleansing of the skin with soap and water, care being taken to entirely remove the soap with alcohol and the alcohol with ether. An alkaline soap will tend to produce skin irritation, while alcohol chemically neutralizes dichloramine-T. This area of the skin is then generously sprayed or painted with a 5 per cent solution of dichloramine-T. After the completion of the skin sterilization, the gauze plug is removed and the wound is cleansed in a like manner.

(*a*) *Incised Wounds.*—All bleeding vessels are ligated with catgut, the wound surfaces covered with a 5 per cent solution of oil, and then the edges closed with widely separated sutures and without drainage. We strongly advise against the use of drainage of any kind in the primary suture of wounds; it should be unnecessary when employing dichloramine-T and always provides a definite focus of infection. Dichloramine-T does not affect the tensile strength or the holding of the knots of catgut after an exposure of more than three weeks, so that the danger of secondary hemorrhage from the slipping or premature absorption of ligatures can be disregarded. The capillary ooze in the presence of dichloramine-T and chlorcosane is decidedly less than with any other germicide we have used, and there will rarely be more oozing than the tissues are normally able

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to care for, while you have placed in the tissues a mass of germicide that makes infection very improbable. Thus the two indications for draining incised wounds, hemorrhage and infection, are almost entirely eliminated when dichloramine-T is used. In the subsequent dressings, the surfaces and wound edges may be sprayed daily, or even less frequently, with a 5 per cent solution of oil until the wound is dry. If infection develops, it is only necessary to remove one or two stitches, to obtain a small opening through which the solution may be introduced into the depths of the wound. This may be done with a glass syringe and glass pipette attachment. It has been our experience that infection will be controlled, when developing after the primary suture of incised wounds, on an average in five and one-half days.

(*b*) *Lacerated Wounds.*—After the same preparation of the skin and of the wound, all the devitalized tissue that it is mechanically practicable and anatomically justifiable to take away is removed with knife, scissors and forceps; and all foreign bodies and splinters of bone (if they be detached from the periosteum) should be removed with scrupulous care. If the primary operation takes places within 3 hours of the injury, the wound should be closed by suture without drainage, after thoroughly covering the wound's surfaces with the 5 per cent solution of the oil. Healing by first intention in wounds closed by primary suture depends largely upon the absence of tension of the sutures. When mechanically impossible to approximate the edges without tension the practice of débridement, as suggested by Dehelly, should be employed. Continued experience with the germicide has taught us to treat in a similar way lacerated wounds after an interval of 6 hours. When infection subsequently develops the previously described technique is followed, just so many of the stitches being removed as will allow for the introduction of the oil to the focus of the infection.

(*c*) *Crushed Wounds.*—When these involve the hands and feet, the treatment and results are not very different from the lacerated wounds. The increased mass of devitalized tissues will require more extensive excision. The time of healing, of course, is increased, tendons require more time than subcutaneous tissues; bone more than tendons; while the longest time required for healing is when there is joint involvement. The treatment of compound fractures, when involving the small bones, should be along the same lines described in the care of lacerated wounds. The question of secondary suture, which rarely enters into the problem of the care of the incised,

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punctured, and perforated wounds, is a common procedure in the massive wounds, as compound fractures of the long bones. Our study of the bacterial contents of infected wounds has demonstrated that it is possible with dichloramine-T to bring the count to the point of clinical sterility, one bacterium per 10 microscopic fields, for three successive days, just as promptly as with hypochlorite, and we successfully practice the secondary suture of wounds as with the use of hypochlorite.

We feel that a more accurate estimate of the bacterial content of the exudate of infected wounds is obtained by cultures than by an examination of smears, and a bacterial curve obtained from cultures is more accurate in determining the time for secondary closure of wounds. This method has been reported to the Philadelphia Academy of Surgery and will be published in the *Annals of Surgery*.

(*d*) *Massive Wounds.*—It is often mechanically impossible or surgically undesirable to close such wounds by sutures and here the primary operation in no way differs from that of the treatment of lacerated wounds, except in degree. In these wounds the question of dependent drainage is always to be considered, and provided, if surgically indicated. At the completion of the operation the surfaces of the wound are thoroughly covered with a 5 per cent solution of oil and then wide-meshed paraffined gauze strips are placed directly in contact with the raw surfaces of the wounds to make the subsequent removal of the dressing painless. Over the paraffined gauze, not more than four layers of gauze should be placed.

The curve of the bacterial content of the wound serves as guide for the quantity and frequency of the application of the germicide in these massive wounds.

SUPPLIES USED IN THE PENNSYLVANIA HOSPITAL AND IN THE HOSPITAL OF THE UNIVERSITY OF PENNSYLVANIA IN CONNECTION WITH THE USE OF DICHLORAMINE-T

Articles on the Dressing Table

2 oz. glass-stoppered, amber-glass bottle of dichloramine-T dissolved in chlorcosane.

Small electric sterilizer.

Tray for sterilized instruments.

Tray for soiled instruments that are to be replaced in the sterilizer.

Instruments.—6 pair dissecting forceps; 6 pair scissors, straight

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and curved; 2 pair hemostats (Jones' straight or curved); 2 grooved directors; 2 pair Foerster's sponge forceps; 1 pair large sterilizer forceps; 1 ground glass syringe, 2 c.c. (Luer type); 3 glass pipette attachments for syringe; 1 atomizer, all glass; 2 small sized soft rubber catheters for introducing oil in small sinuses; 2 small medicine glasses for the solution of dichloramine and sterile albolene.

Dressings.—Gauze in single layers, unfolded, cut in the following sizes, 2 x 2½ inches, 3 x 4, and 4 x 6 inches. These gauze dressings are unwrapped and laid in piles on a sterile towel.

Cotton Sponges.—Made by enclosing a pledget of cotton, about the size of a hickory nut, in a single layer of gauze to prevent the fibers from sticking on the wound surfaces when blotting up excessive secretions.

Cotton Applicators.—Cotton tipped sticks for swabbing out the cavities of wounds or of abscesses and applying dichloramine where a spray is impracticable.

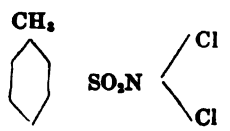
Paraffined Mosquito Netting.—For burns and open wound dressing.

Sterile Gloves.

Albolene or Liquid Petrolatum.—For loosening adherent dressings and cleansing the skin.

THE PREPARATION OF DICHLORAMINE-T, AND ITS CHEMICAL ACTION

Dichloramine-T is prepared from toluol by a series of chemical reactions which lead to a substance having the following structural formula:



Preparation of Dichloramine-T.[1]—The following details were worked out from Chattaway's method of preparation:

Chlorinated lime (from 350 to 400 gm.) of good quality (of 25 per cent or more of available chlorine) is shaken with 2 liters of water on a shaker for half an hour, and then the mixture allowed to settle. The supernatant fluid is siphoned off and the remainder filtered.

Powdered toluene-parasulphonamide, 75 gm. (the crude product may be used), is then added to the whole of the hypochlorite solution

[1] Dakin, Lee et al., Trans. Am. Surg. Assoc., 1917.

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and shaken till dissolved. The mixture is filtered, if necessary, placed in a large separating funnel, and acidified by the gradual addition of acetic acid (100 c.c.). Chloroform (about 100 c.c.) is then added to extract the dichloramine, and the whole is well shaken. The chloroform layer is tapped off, dried over calcium chloride, filtered, and allowed to evaporate in the air. The residue is powdered, and dried *in vacuo*. It is sufficiently pure for most purposes without recrystallization.

The sodium toluene-parasulphochloramine, which is sold under the trade name of chlorazene, may be used instead of the toluene parasulphonamid.

A Second Method of Preparing Dichloramine-T.—Fifty grammes of para-toluenesulphonamide are dissolved in 500 c.c. water, and 100 gms. of sodium acetate and 100 c.c. of chloroform are added. The container is immersed in cold water, and a rapid stream of chlorine is passed in until the mixture is saturated. The mixture is allowed to stand a few hours and, if the odor of chlorine disappears, more of the gas is passed in. If necessary, more chloroform can be added to dissolve the dichloramine. From this point the procedure is the same as in the preceding method.

Its use as a disinfectant is dependent almost wholly on the reactions of the NCl_2 group in the side chain. In this group the chlorine (Cl) is very loosely held and is given off whenever the substance comes in contact with any other material having an affinity for chlorine. When detached from this compound chlorine is in the free nascent state and exerts all of its characteristic elementary reactions.

Free chlorine unites with nearly all common substances and materials to form chlorine compounds which are, as a rule, less stable than those substances from which they came. The well-known action of bleaching powder depends upon this fact. It is the chlorine in the bleach which attacks the colored substances in the cloth, forming chlorine compounds with them. These chlorine compounds are subsequently destroyed by the oxygen of the air or other agencies. The union of chlorine with other substances is greatly hastened by the presence of water and even by the small amount of moisture in the air, by the action of light, especially direct sunlight, and by heat.

To return to dichloramine-T.—This substance is almost insoluble in water. It is soluble in a considerable number of organic solvents and oils. For example, it is soluble in benzol, chloroform, carbon

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tetrachloride, alcohol and acetone. It is soluble in many essential oils, eucalyptol being one of them. Those solutions in which the solvent cannot be attacked by chlorine are stable. Thus carbon tetrachloride, which contains all the chlorine it is capable of taking up, being saturated with it, forms a stable solution of dichloramine-T. Alcohol, on the other hand, is broken down by free chlorine and, as it rapidly abstracts chlorine from dichloramine-T, it is itself rapidly changed into other substances, and therefore the alcoholic solutions of dichloramine are very unstable.

For the purpose of applying it to wounds the dichloramine must be in solution. Carbon tetrachloride or chloroform, while forming stable solutions, are not suitable solvents, for they cannot be applied to living tissues in quantity for any length of time. Eucalyptol was first chosen as the solvent, after a careful search, as the best one available for the application of dichloramine-T to the tissues. Eucalyptol, however, has an affinity for chlorine and it quickly breaks down the dichloramine-T, therefore it is necessary to partially saturate the eucalyptol with chlorine before adding the dichloramine-T. Its affinity for chlorine, however, cannot be completely satisfied, and the stability of the resulting solution is far from permanent. Dichloramine-T is slowly decomposed when dissolved in chlorinated eucalyptol and the chlorine is given off and toluol-sulphonamide (an intermediate product between toluol and dichloramine-T) is left. This substance crystallizes out. The chlorine given off is partly set free into the air and partly acts further on the eucalyptol to produce irritating volatile products. The decomposed solutions frequently cause pain when applied to wounds.

The decomposition of dichloramine-T in chlorinated eucalyptol, which normally is a very slow process, three to four weeks for a 20 per cent solution and much longer for the weaker 5 per cent strengths, is hastened by the presence of water, alcohol, or anything that has an affinity for chlorine. It must be realized that chlorinated eucalyptol is capable of absorbing a certain amount of water from the air, and hence it is essential to keep all solutions in air-tight or glass-stoppered bottles. The breakdown of such a dichloramine solution is also hastened by the action of light, especially direct sunlight, and by any rise in temperature.

Because of the foregoing reasons particular attention must be paid to the following points in handling dichloramine-T in a solution of chlorinated eucalyptol:

1. It should be supplied to the wards in small containers only.

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As much as will be used in one or two days. For the average hospital ward this is rarely more than one ounce.

2. All stock bottles should be of a very dark amber color and glass stoppered. They should be thoroughly cleaned and dried before any of the materials are put in. If alcohol is used for drying the bottles, it should be allowed to completely evaporate before the bottles are used.

3. No solutions should be returned to the stock bottles from the ward bottles or atomizers at any time.

4. Bottles in which the solution has already undergone decomposition should be carefully cleansed with hot water and then dried thoroughly before being used again.

5. In using the solution, medicine droppers, pipettes, or glass rods should not be used to transfer the oil to the wound surfaces from the stock bottles. The common practice in some hospitals has been to sterilize these instruments by boiling, and then to use them while still wet. This results in the gradual accumulation of water in the stock bottles and a very rapid decomposition of the dichloramine-T. The droppers, pipettes, glass rods and syringes, if left in contact with the oil for five or ten minutes, are entirely sterilized and do not need boiling. The method we have followed is to pour the required amount for the wound into a clean, dry medicine glass and to take the oil from this second container with a pipette. Nothing should be allowed to come in contact with the stock solution, and unused portions of the oil should never be returned to the stock solution.

6. The atomizers should be cleaned frequently by blowing a small quantity of chloroform through them.

NOTE CONCERNING OIL SOLUTIONS OF DICHLORAMINE-T

The instability of solutions of dichloramine-T in the chlorinated eucalyptol and paraffine oils led Dr. Dakin to search for another solvent, and in chlorinated paraffine wax, "Chlorcosane,"[8] a great many of the disadvantages of the former solvents have been eliminated.

"Chlorcosane" is a heavy oil prepared from paraffine wax by replacing part of the hydrogen in the compounds contained in the wax with chlorine. Those hydrocarbons which predominated in solid paraffine are designated by names ending in "cosane" (*e. g.*, tetraco-

[8]Chlorcosane possesses so many advantages over eucalyptol, which was first used as a solvent for dichloramine-T, that there is now no longer any occasion for using eucalyptol as a solvent for dichloramine-T.

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sane, $C_{24}H_{50}$) so that the term chlorcosane indicates a chlorine derivative of this series without specifying any definite chemical constitution.

PREPARATION OF THE SOLVENT CHLORCOSANE

Paraffine wax, preferably melting at 50° C. or higher, is placed in round-bottomed flasks and heated to about 120°. Two flasks connected in series, each containing half a kilo of wax, may be conveniently used. A rapid current of chlorine from a cylinder of the liquefied wax is then passed through the molten wax in the flasks, each of which is provided with a thermometer and the necessary glass tubes. The temperature should be controlled within the limits of 125 to 140°. The first flask in which the reaction is most vigorous will require but little heating. Chlorination is continued until the contents of the flasks have increased in weight 45 to 55 per cent of the weight of the wax taken. It will be found convenient to complete the chlorination of the first flask and then remove it, and transfer the second to its place, putting a fresh flask of paraffine wax after it. In order to avoid undue discoloration of the product, a minimum amount of rubber tubing should be used for the connections. Wide glass tubing should be used for passing the gases, and the ends of the delivery tubes are preferably blown into bulbs provided with a number of fine orifices to promote good contact between the gas and oil. Hydrochloric acid is, of course, evolved during the reaction. After the requisite amount of chlorine has been absorbed, the oil, while still warm, is shaken vigorously with 5 per cent of its weight of dry sodium carbonate and then filtered through dry fluted paper. The clear oil, which has a light yellow or sherry color and is slightly heavier than water, is then ready for use. It possesses a viscosity intermediate between that of olive and castor oil, has almost no odor, and is perfectly bland when sprayed into the nose, on the skin, or upon wounds.

Owing to the high viscosity of chlorcosane, it but slowly dissolves the antiseptic, dichloramine-T, at room temperatures. To prepare a solution, it is advisable to proceed as follows: Glass only should be used and all utensils must be perfectly dry. The required amount of dichloramine-T is carefully mixed with one-quarter of the entire amount of the chlorcosane by means of a glass pestle and mortar. The resulting paste is a fine suspension. This process should occupy about 30 minutes. The suspension of dichloramine-T is then poured into the remainder of the chlorcosane and the whole placed in a

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dark amber glass-stoppered bottle. This suspension is frequently agitated during the following twenty-four hours, by which time it should be entirely dissolved. The solution is then filtered through filter paper into its final container.

Chlorcosane will hold from 8 to 10 per cent of dichloramine-T in solution at ordinary room temperatures. For the treatment of wounds it is rarely desirable to exceed 5 per cent, and for nasopharyngeal spraying 1 or 2 per cent will be adequate. The solution may be applied directly to the surfaces of a wound by any convenient method, among which spraying has been found satisfactory when all parts of the wound can be reached by this means. Where this is not possible, a cotton swab, medicine dropper or glass syringe and pipette may be employed.

Solutions of dichloramine-T in chlorcosane are remarkably stable considering the high reactivity of the antiseptic. The most deteriorating influence is exposure to light. Solutions should be kept in amber-colored bottles and shielded from strong light. Heat and moisture tend to decompose dichloramine-T. Solutions kept under favorable conditions suffer no material decomposition for several months. When decomposition takes place, it is betrayed by the separation of insoluble substances (chiefly toluene-parasulphonamide) and solutions which exhibit an abundant deposit should be discarded. Fresh solutions, if chilled, may temporarily become cloudy or even precipitate, owing to the separation of either dichloramine-T or of paraffine wax. On gently warming the solutions will, in such cases, become clear and are suitable for use.

In ordinary wounds the application may be once in 24 hours and the dressings very light. In gangrenous or foul wounds a more frequent application should be made, since the active chlorine is more rapidly consumed.

Best Method of Storing and the Stability of each Preparation Separately and Combined.—Dichloramine-T should be stored in small amber bottles and protected from excessive heat. Ordinary temperatures are not injurious. Under reasonably favorable circumstances it is stable for years. As regards the solvent, no special precautions seem to be necessary. The solvent appears indefinitely stable. It would probably be advisable to have the oil put up in bottles of such volume that one bottle of dichloramine-T can be dissolved in the contents of the bottles of oil. The solution, when prepared, should be kept in amber glass-stoppered bottles and may safely be used for two months.

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Simple Test for the Strength of Dichloramine-T.—The strength of dichloramine-T, or its solutions, is most conveniently estimated by taking weighed amounts (1.1 gram of dichloramine-T or 0.5 gram of its solutions), adding 5 c.c. of carbon tetrachloride, then excess of potassium iodide and acetic acid. The liberated iodine is titrated with decinormal sodium thiosulphate. Each cubic centimeter of thio is equivalent to 6 mgs. of dichloramine-T.

Simple Test for Decomposition and Obvious Signs of Decomposition.—Decomposition of dichloramine-T itself is evidenced by a strong smell of chlorine and incomplete solubility in chloroform. Advanced decomposition of solutions of dichloramine in chlorcosane is shown by the deposition of crystals of toluenesulphonamide.

The solutions of dichloramine-T in chlorcosane should be neutral. The presence of the slightest trace of acid, which is usually hydrochloric or hypochlorous, will decompose the dichloramine-T, and when this process of decomposition is once initiated it progresses very rapidly. Acid decomposed solutions irritate the skin.

A Test for Acidity of Solutions of Dichloramine-T.—A piece of filter or blotting paper is saturated with ammonia water and held over the surface of the suspected solution. If the slightest trace of acid is present, white opaque fumes of ammonium chloride will be given off from the paper.

This acidity of the solution arises from two causes.

1. In the manufacture of the chlorcosane all of the hydrochloric acid has not been neutralized.

Test for Acidity of Chlorcosane.—10 c.c. of the chlorcosane is shaken with an equal portion of water in a test tube. The mixture is allowed to stand for twenty-four hours, when the supernatant water is tested for acid with litmus paper or litmus solution.

2. In the manufacture of the dichloramine-T a certain amount of free chlorine has been allowed to remain in the finished preparation. Dichloramine-T should not have a strong ordor of chlorine. A faint chlorous odor, not any stronger than that of violets, is all that is permissible.

Merits of New Solvent.—It is made of extremely cheap materials which are always available in practically unlimited quantities. The solvent is extremely stable and does not liberate hydrochloric acid readily on standing as do some samples of chlorinated eucalyptol. Furthermore, the process of preparing the new solvent is very simple and could easily be worked by any competent manufacturer. It is bland, non-volatile and tasteless.

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The Bactericidal Strength of Dichloramine-T.—The bactericidal strength is very high. It can effect more disinfection than any equivalent of hypochlorite since it is less rapidly decomposed by serum or living tissues. The figures given in the book by Dakin and Dunham, on pages 86-93, furnish certain figures concerning its germicidal efficiency. New experiments on the disinfecting action of dichloramine-T, in the new solvent acting on infected tissues, confirm and amplify the experiments referred to.

Many of the commercial preparations now on the market fall far short of the minimum standards we found to be necessary.

Dichloramine-T and chlorcosane must at least meet with the following tests before it is justifiable to use them for surgical purposes.

Specifications for Dichloramine-T

I. Dichloramine-T, toluene-para-sulphondichloramine, should contain not less than 29% active chlorine, as determined by titration with standard solutions of sodium thiosulphate. It should be devoid of a sharp odor of chlorine or hydrochloric acid, but should possess a sweetish chlorous odor very much like that of violets. It should dissolve readily and completely in carbon tetrachloride and chloroform.

Method for Determining the Percentage of Strength of Dichloramine-T.

Reagents:

1. Caustic soda solution, 2%.
2. Potassium iodide solution, 10%.
3. Acetic acid solution, 10%.
4. Decinormal sodium thiosulphate solution. This is prepared by dissolving 24.8 grams of the pure crystals in distilled water and diluting to 1,000 mils. The solution is moderately stable if protected from light, and will serve for two or three months.
5. Starch solution. Prepared by boiling about 0.1 gram starch with 100 mils. water, cooling, and allowing to sediment. The clear solution is used as an indicator.

Dissolve 0.20 gram of the dichloramine-T in 20 mils. of caustic soda solution 2%. When completely dissolved, add 5 mils. potassium iodide solution 10%, and 10 mils. acetic acid solution 10%.

The liberated iodine is titrated by adding the decinormal sodium thiosulphate solution from a burette until almost all the iodine has disappeared. A few drops of the starch solution is now added, and the addition of decinormal sodium thiosulphate solution continued until the blue color just disappears.

The percentage of strength of the dichloramine-T is obtained by multiplying the number of mils. of decinormal sodium thiosulphate solution used, by three.

Example: It required 30 mils. of decinormal sodium thiosulphate solution to just decolorize the solution. The percentage of strength of the dichloramine-T is then $30 \times 3 = 90\%$.

Specifications for Chlorcosane.

Chlorcosane is an oily liquid which should closely approximate the specific gravity of water, 1000.

It is necessary that it be neutral, for the slightest trace of acid will initiate decomposition in dichloramine-T. A satisfactory test for acidity is to shake a small portion of the chlorcosane with an equal portion of water in a test tube. Afer 24 hours the supernatant water is tested with litmus.

Chlorcosane should retain not less than 10% of dichloramine-T in clear solution at ordinary temperatures (15 degrees centigrade).

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EDITORIAL

OUR TWENTY-SIXTH ANNIVERSARY

In this the natal month, it behooves us again to rehearse our marching orders and take stock of the accomplishments of The Association of Military Surgeons of the United States during the twenty-six years of its existence.

As set forth in the constitution—

> the object of the Association shall be to increase the efficiency of the medical services of the Army, the Navy, the Public Health Service and of the Organized Militia of the different states, by mutual association and the consideration of matters pertaining to the medico military service of the United States, both in peace and in war.

How far have we measured up to this object? To answer this question fully would require a review of the history of the public medical services for the period, demanding a volume for its setting forth. Those of us who can look back upon the decades antedating 1890 and are permitted to view the situation in the services as it obtains today are amazed at the marvelous advance.

To be sure, the change is not markedly greater than that in the general profession itself, for these years have recorded progress beyond any like period in the history of medicine; indeed, of the world. So it would be remarkable if the public medical services had not participated in the advance. But this is not enough. Have they led, and, if so, has The Association helped that leadership?

The years immediately preceding the Spanish War were formative. We started with little but the traditions of our own and foreign medical services and endeavored to build thereon something that would be practicable, efficient and applicable to our present requirements. The Army was a frontier police; its largest actual unit, a company. The Navy was without ships, and the functions of the Marine Hospital Service were what its then name implied—the management of public hospitals for sailors, located at certain larger ports. The medical department of the state troops was constituted from medical men, and sometimes not even medical men, selected by the regimental commanders, often for personal or political reasons, with no loyalty to a corps and little appreciation of the duties of their position.

The composition of a division of troops was then unknown to the official regulations of the Army. Men had grown old in the service

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without seeing even a regimental drill. A field hospital or ambulance company was non-existent and apparently was not even dreamed of. Operating rooms and laboratories were, like St. Paul's definition of faith, "the substance of things hoped for, the evidence of things we have not seen." Nor was it different in the Navy or Marine Hospital Service—Rip Van Winklelike we had been asleep since the Civil War.

By strange coincidence, the awakening of the public medical services and the birth of The Association were almost identical in time, and it cannot be doubted the latter was a distinct factor in bringing to public attention that the services had been asleep and in causing the people to demand that they should throw off their lethargy and join the advancing column.

The Spanish War found the services awake and stretching, but naked. The Association, though then not strong in numbers, came to the rescue at this critical moment, volunteering almost to a man to help in every way possible in the considerable work that fell upon the unprepared shoulders of their colleagues. It was a real help and alone justified the existence of our organization.

Since that period The Association has kept in close touch with the public medical services and participated in every advance each has made—advances the like of which were not paralleled in all their history.

With the entrance of our country into the great war, the responsibilities of The Association have multiplied, and we have opened wide our portals to the new medical officers, accepting them without question into an organization which had attained the dignity of age and membership in which had been carefully guarded.

We welcome the new members who have come to us in thousands, and who, we are sure, will preserve the honorable traditions and customs which have been handed down to us through the years by men whose names and memory are honored in the profession. We look to them to add even greater luster to The Association; so great, indeed, that its name shall remain forever unsullied and membership therein shall be counted one of the highest professional honors.

Notwithstanding we are well past our majority, certain things that our founder, the lamented Senn, outlined in our marching orders yet remain unaccomplished. The public service medical school in which we shall educate our officers from the ground up, as at West Point and Annapolis, is still in the womb of the future. Its advantages—nay, necessity—are becoming more and more apparent

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as the country calls upon the officers of the three public medical services for interchangeable duties. Had these all been educated in the same school they would have known each other, would have been more or less familiar with the special duties of each service, and would therefore have immediately made a team the like of which is now impossible. Such a school is bound to come, setting the standard for all other medical colleges in our country—the faculty drawn from the best the profession affords; the students appointed as are cadets to the Military and Naval Academies, and the output, the survival of the fittest. Wonderful will be our public medical services when this happens; and happen it must, sooner or later.

Then our state branches and international organization. A general annual convention of a great society is sufficient, but this, to be effective in result, should be backed up by state organizations or even smaller subdivisions, in which there is brought about that touch of elbow so necessary to good understanding. Then, crowning it all, an international association of our colleagues of the allied nations, making a world medico-military association of commanding dignity, membership in which would be valued beyond all other societies, because it signifies first of all what our motto so well states—*Omnia pro patriae caritate.* In this organization our children and children's children would seek to perpetuate this sentiment and commemorate the patriotism and accomplishments of their forebears—a grand vision, now so easily made possible.

"SACRIFICE"

I must confess that I am growing a little weary of seeing this word so often in our home papers in reference to military service—"the most overworked in our language," as one of our prominent officials in the Medical Department expressed it after ten weary months of intercourse with patriots of various sorts.

Our profession has harped on this subject enough; it is time to drop it. Whatever may have been the motives with which we enlisted in the Medical Reserve Corps, we are in it now "for better, for worse, for richer, for poorer" (especially the poorer). This is no time for post-mortems, nor for speculations as to conditions after the war. The present alone concerns us.

Never before since history began have we had such an opportunity to render in full measure the service to humanity which has been the ideal of those who have not bowed the knee to Mammon.

We have been inclined to count the cost. We have hung back

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and talked about "sacrifice" when we ought to have thought only of the precious privilege granted to us of serving our country. The familiar question of the politician, "What is there in it for me?" has been too often on our lips. That time has passed, thank God, and the expansion of our corps since last summer to over three times its number is the best answer to the reproach that it would be necessary to conscript doctors as well as laymen. We have put our hand to the plough, but some are still casting a backward glance and thinking of what they have left behind.

Forget it! Money, worldly success, home, friends—we have put them all behind us and think only of duty; of the opportunity, of which we never dreamed, to set the seal of loyal service on the scroll which our children and our children's children will read with pride and envy.

Who of us would have missed the experience over here? Who thinks now of the narrow, humdrum life of a civilian beside this that transforms and ennobles the dullest soul?

H. C. Cox.

THE ENLISTED SOLDIER

We, who have been in close touch with medico-military conditions for several months, both at the front and in the interior zones, have felt more keenly than in time of peace that all the complicated machinery of the staff departments is operating for one single end—to maintain the efficiency of the fighting-line. Generals may come and go, but the enlisted man keeps on forever—to the end. To deliver him in perfect physical condition to the zone of action, to keep him in health, mental as well as physical, to evacuate him promptly to the rear when disabled, is the function of the Medical Department.

In our army this work begins at home, continues on his voyage, at the port of debarkation, in the rest camp and along the long line of communication up to headquarters and—beyond. Its importance cannot be overestimated, though it possesses none of the excitement, or dramatic incidents, surrounding duty in base hospitals. The hundreds of young Medical Reserve Corps officers whom we have met chafe under their prosaic tasks, far from the coveted posts at the front, but we, who must take a broader view of affairs, know that it is a man's job, quite as much as operating under fire.

We do not give our enlisted man the *personal* attention which he deserves, and which he must have if he is to be transformed into an efficient fighting machine like the British and French soldier. It is not

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for the medical officer to criticise the company commander, but God help him if in action he expects men to follow him, for whose health and comfort he has never shown the slightest interest. In the doctor it is unpardonable. Yet, some of the recent younger medical officers seem almost to forget the lessons of sympathy and humanity learned in civil practice. Our men are far from home, thrown suddenly upon new conditions, amid strange surroundings, exposed to cold and wet, to disease and death, and we cannot do enough for them. Venereal and contagious diseases are threatening the problems of sanitation are serious and perplexing, and medical supplies often inadequate. Our medical officers must be trained with the one aim of caring for the soldier-man since he it is who must do the fighting, and only fighting will win the war.

H. C. Coe.

Members of committee to arrange for the meeting of The Association of Military Surgeons, October 14, 15, 16, 1918:

Colonel W. N. Bispham, Chairman.
Colonel Roger Brooke, in charge of Professional Program.
Colonel J. C. Gregory, in charge of Ceremonies.
Lieut. Col. M. Ashford, in charge of Housing of Visitors.
Lieut. Col. J. E. Bastion, in charge of Field Exercises.
Major W. F. Manges, in charge of Reception.
Major C. S. Williamson, in charge of Exhibits.
Major W. N. Kenzie, in charge of Entertainment.
Lieut. R. E. Wilson, New Members.

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COMMENT AND CRITICISM

MEDICAL AND SURGICAL HISTORY OF THE WAR

In the valuable and suggestive paper on "A Few Civil War Hospitals," published by Lieut. Col. Casey A. Wood in THE MILITARY SURGEON, May, 1918, it is shown that the present base hospitals in our various camps and cantonments "are almost exact replicas of structures erected in this country during another great war over half a century ago." "The Medical and Surgical History of the Civil War," did we but care to use it, is, in fact, even thirty years after the publication of its last volume, a wonderful repository of things which seem almost new today. There, as recent English authority reminds us, you will find the first account of trench nephritis (Grant's campaign of 1864); there Da Costa's work on irritable heart in soldiers ("D. A. H."); there the ipecac treatment of dysentery (A. A. Woodhull); there the first attempts at systematic prevention of venereal disease in a great war; there the epoch-making studies of Mitchell, Morehouse and Keen on the effects of gunshot injuries of nerves, which led to Mitchell's great monograph of 1872, the starting point of the recent studies of Marie and his associates on gunshot injuries of the peripheral nerves; and there, also, the technical side of Letterman's work (Ambulance System).

From these findings, which are not mere "coincidences," we may indulge in a rough estimate of the present worth and maturity value of the projected Medical and Surgical History of American participation in the present war. What, then, is the ultimate use and *raison d'être* of such an undertaking? Does it not lie essentially in its enormous *teaching* value for any future war in which our country may be engaged? Should it not be our ambition to give it the same status as the pathological monographs of Virchow or the surgical repositories of John Hunter and Jonathan Hutchinson, for didactic purposes? The answer is to be found in the opinion expressed on the Medical and Surgical History of the Civil War by Virchow himself. In his well-known address of 1874[1] Virchow praises the "critical, genuinely scientific spirit, the open mind, the sane practical sense, which informed every department of the American army medical establishment and which, with the splendid support of an entire nation, reached the highest point in humanitarian achievement in any great war."

[1] Virchow: Die Fortschritte der Kriegsheilkunde, Berlin, 1874.

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He who examines the extensive publications of the Medical Department of the United States Army will be continually surprised at the wealth of experience contained in these volumes. The utmost exactitude in detail, the most carefully considered minutiae in statistics, a learned exposition embracing all phases of medical experience, all these are coordinated and combined in a way to preserve the knowledge acquired at such tremendous cost and transmit it to posterity.

This eloquent pronouncement is a true expression of the view actually entertained of this work by the best of the European medical profession. This history, now of thirty to fifty years' standing (1870-'88), is still drawn upon by our European confrères, and the end is not yet. Let us bear in mind that the whole value of any great medical text, from the Hippocratic writings down, is simply to enable the physician to teach himself. He who regards his medical education as finished when he takes his degree is the proverbial "educated fool." An expensive medical education has been well defined as that which begins at graduation and is only acquired by autodidactic method; for an incompetent may sit at the feet of the greatest masters and, as *Punch* said, "nobody the wiser for it." The younger medical officer who neglects the healing side of his calling is he who most exposes his corps to criticism. In addressing the graduates of the Army Medical School, John S. Billings said: "Your medical rank may, on rare occasions, be an important matter in dealing with the rank and file, but your medical skill and tact are more important in the ordinary routine of army life." To combine administrative capacity with real medical knowledge and ability is to be the best type of medical officer.

The subjoined statement represents the preliminary work of the board appointed by the War Department to prosecute our contemplated Medical and Surgical History of the present war. The best of the clinical and surgical material in our base hospitals, here and abroad, will probably not be accessible until the end of the war; but if the provisions of paragraph 5 be carried out, the most valuable part of it may be obtained, either in printed or typewritten shape, as the war wears on. The large number of valuable monographs published by the English Medical Research Committee shows the wisdom of this line of procedure; and it is interesting to note that this Committee subserves the triple interests of medical war history (for Great Britain), scientific research, and "National Health Insurance," *i. e.*, the adjudication of pension claims. The important outstanding themes—cerebro-spinal fever, trench nephritis, Medi-

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terranean dysentery, D. A. H., gas poisoning, wound shock, oxygen needs of aviation officers—are not allowed to go stale and languish, but are handled and taken care of *now* by the proper experts. This idea of interim publication is freely and generously encouraged by our chief, the Surgeon General, and is amply supported by our best medical periodicals. The pages of THE MILITARY SURGEON have been accessible for this purpose since the war began.

The rest of the American material lies in our hospitals in France, England and Italy, and Colonel McCulloch, executive officer of the board, has recently been detailed to go overseas to establish the administrative ways and means for its ultimate collection and redaction. This may require careful selective scrutiny and consideration of historical reports assembled at headquarters and in hospital, for it is probable that not all of this material can or need be transported overseas at the close of the war. But when this main task of assemblage has been accomplished the rest should take care of itself. In connection with the subjoined, it may be said that tentative plans for the ultimate arrangement and composition of the work have been drawn up, and that special units are already engaged in collecting pathological and graphic material.

During the absence of Colonel McCulloch in Europe, Lieut. Col. Casey A. Wood, M. C., will be in charge of the Division of Medical History, S. G. O.

F. H. GARRISON.

ACTIVITIES OF THE BOARD FOR COLLECTING AND PREPARING MATERIALS FOR THE MEDICAL HISTORY OF AMERICAN PARTICIPATION IN THE WAR

July, 1917, to July, 1918

Organized by Special Order A. G. No. 196 (August 23, 1917), this board has been mainly occupied to date in collecting the raw materials for the ultimate composition of this history and in devising ways and means for carrying out the plans of the same. After correspondence with Sir Walter Fletcher, Sir William Osler and others in England, it was decided to start at the point at which the English authorities had arrived, after a careful consideration of three years material, viz., to project a series of volumes in which the different themes are treated as well-considered, exhaustive monographs individualized by the actual authorship of those whose knowledge or experience in the different subjects is most authoritative.

In accordance with this plan, the following has been accomplished:

1. The interim reports and protocols by medical officers of the U. S. Army on duty as observers in England and France have been

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collected from the War College and the Council of National Defense, and a catalogue, giving brief abstracts of their contents, has been mimeographed and circulated.

2. Memoranda to medical officers in the field, requesting that they collect material for this history, have been printed and circulated.

3. Every effort has been made to collect the individual histories of the administrative divisions in the Surgeon General's Office, and of the camps and of the base hospitals in the United States. Most of this material is now on hand.

4. Steps have been taken to secure continuity in these histories by means of annual historical reports (for administrative divisions) and by medical war diaries (for camps and base hospitals).

5. Through a circular issued by the Hospital Division, the commanding officers of base hospitals have been authorized to direct preparation of subject indices of medical and surgical cases, with the tacit understanding that these become available for the use of the Historical Division at the end of the war; and to send in, as manuscripts or as reprints (either for record or publication), accounts of epidemics, group diseases or unusual medical and surgical cases occurring in hospital, as part of this history. In this way much of the historical material will be actually assembled during the war, and the delays occasioned by the priority of pension claims will be to some extent obviated. In England, this plan is actually in process of realization through the publications of the Medical Research Committee (London).

6. A tabular statement, concerning the movement of the preventable diseases, has been made by this board each week since September, 1917. These tables, based on the weekly telegraphic reports made to the Division of Sanitation, concerning thirty-one separate cantonments, will be a first instalment of the history of mobilization in its first year (September, 1917, to September, 1918), and should be available before the end of October, 1918.

7. Arrangements have been made to take care of the historical material relating to American participation on the western front, already accumulated in France, and for the accumulation of similar material in Italy (southern front).

8. Friendly relations have been established with the military authorities controlling the medical history of the war in Great Britain, France and Italy.

9. An advisory council, consisting of Col. Victor C. Vaughan, Lieut. Col. William H. Welch and Lieut. Col. Casey A. Wood, has been appointed to assist this board in passing upon applications for commission or employment, expansion of the board and other matters under advisement.

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CURRENT LITERATURE

The Complete Elimination of Dressings After Aseptic Operations, by A. Chalier (Prog. Méd., xliv, No. 14, April, 1917, p. 116), abstr. in Arch. de Méd. et de Pharm. Milit., T. lxvii, No. 4, p. 560, April, 1917.

Chalier demonstrates the possibility of doing away with all dressings after aseptic operations, providing attention is paid to three indispensable conditions: asepsis, perfect hemostasis, hermetic closure of integuments. The only treatment, after the operation is finished, consists in the application of a little tincture of iodine every day or two. In the 34 different operations which he enumerates and specifies, he obtained union per primam without the least drop of pus or hematoma.

"Such results, otherwise not extraordinary, demonstrate at any rate that the elimination of dressings after aseptic operations is attended by no risks, especially for an improvised hospital within the war zone where large wounds with frequent infections are met with. Such results are to be expected only by strict attention to asepsis, complete hemostasis and faultless suturing of all the tissues (*en étages*) and a hermetic closure of the skin." To the end of obtaining the latter, Chalier uses the supporting sutures of Michel (*agrafes de Michel*) placed at 5 to 4 cm. from the incision.

The complete elimination of all forms of dressings offers the following real advantages: economy in time and material, easy inspection of wounds. All operated cases, placed in a separate ward or contiguous wards, are thus inspected quickly and their progress watched daily or several times a day.

H. G. Beyer.

Report on 134 Cases of Gaseous Gangrene, by G. Gross (Com. à la Soc. de Chir. de Paris, séance du 7 Mars, 1917), abstr. in Arch. de Méd. et de Pharm. Milit., t. lxvii, No. 4, April, 1917, p. 561.

In analyzing the 134 cases of gaseous gangrene, Gross arrives at some interesting conclusions. Regarding the nature of the causative agent he found that, in 117 cases, it was shell fragments, in 10 grenades, in 3 shrapnels, in 4 projectiles. Muddy pieces of cloth, carried into wounds by shell fragments, cause this difference. As to location, the distribution was: 5 cases on forearm, 10 cases on arm, 73 cases on leg, 46 cases on thigh. Fifty-two out of the 134 cases were limited to wounds of the soft parts; 82 included fractures with lacerated muscular tissues. Lesions of large vascular trunks were found in 46 out of the 134 cases.

Treatment.—Gross practices large incisions, complete excision of destroyed tissues down to healthy bleeding surfaces, then lavage and application of ether. The *toxic form* of gaseous gangrene justifies not only amputation or disarticulation, but also an operation high up, done as soon as possible and as quickly as possible. The rapidly progressive

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clinical form of gaseous gangrene may call for either amputation or multiple and deep incision, according to the extent to which the process may be limited by treatment.

Out of his 134 cases of true, diffuse gaseous gangrene Gross had 57 recoveries, in 46 of which amputation or disarticulation was done, in 11 large incisions. In the 77 fatal cases, 51 had been amputated or disarticulated; in 26 multiple incisions had been made. Analysis of the cases clearly shows that gaseous gangrene affects wounds of the lower extremities more frequently and is followed by greater fatality than of the upper extremities; the later the operation is done, the greater the death rate. Cases of *gaseous abscess* only resulted in 7 deaths in 34 cases.

These figures would show that, by judicious treatment, cases of gaseous gangrene need not always and necessarily prove fatal, and that the mortality may be reduced to 60 per cent of the number of cases.

H. G. Beyer.

Gunshot Injuries of the Peripheral Nerves, by Leo Mayer, A.M., M.D., New York. *Intern. Jour. of Surgery*, vol. 31, No. 3, March, 1918, pp. 79-87, with 8 illustrations.

This is a paper that no military surgeon would, knowingly, want to overlook.

"Lesions of the peripheral nerves complicate a large percentage of gunshot injuries to the extremities, and no examination of a wounded soldier is complete unless the surgeon tests the function of the nerves which may have been injured. This neurological examination is important even at the front, since the treatment of the nerve injury should begin as soon as the patient reaches medical hands." The practical surgeon, with some experience in nerve injuries, either at the front or in base hospitals, will at once appreciate the profound significance in the author's words, that *"a splint for the nerve is frequently fully as important as a splint for the fractured bone, and just as the bone injury must be treated at the front, so, too, should the nerve injury be properly cared for without delay."* The author then proceeds with a brief outline description of the tests to be applied to the most important nerves, such as the musculo spiral, the ulnar, the median, sciatic and musculo-cutaneous and which any surgeon could make, without any other instrument except a needle to determine the anesthetic area.

In speaking of the treatment of nerve injuries, the author emphasizes the general principle laid down originally by Thomas and which maintains "that when a muscle, temporarily paralyzed, is constantly subjected to undue strain by a position of the limbs which puts its fibers on the stretch, the muscle itself degenerates, and, even when the nerve recovers, it will fail to respond to the volition of the individual." This principle in its application to treatment has proved true. The indications for operative intervention are described in detail

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together with the pathology of nerve injuries. It is admitted: "that the conditions for the regeneration are most favorable when there is an intimate union between the axis cylinder processes of the divided nerve ends" and that "upon this fact the operative treatment is based." The various steps, under different pathological conditions of the existing nerve injuries are gone over and described, the various methods of nerve suture shown in the illustrations accompanying the description. Quite illuminating is the diagram illustrating the perineural method of nerve suture and which facilitates handling the nerve without traumatizing it, a principle which the reviewer has often seen sinned against by even very good surgeons. The author's method of filling a large gap in the continuity of a nerve trunk is specially noteworthy, since his illustrations show the success of the method. To fill such gaps sursory nerves are used and the technique is described by the author as follows: "A sensory nerve is laid bare for a sufficient extent, depending upon the number of segments which must be utilized to give a cross section corresponding to that of the injured nerve. It is freed from its bed, completely divided at one end, and then doubled on itself to form a loop slightly longer than the gap to be bridged. At the closed end of the loop the nerve is again divided, except on one side, where the perineurium is maintained intact. . . . Two fine perineural stitches are taken, holding the first segment in intimate contact with the second at its upper and lower extremities. The nerve is then further lifted out of its bed so that a third segment, corresponding in length to the first two, can be measured off and sutured to these, etc." . . . The nerve cable, thus constructed, is implanted into the gap between the ends of the divided nerve and held in place by the typical perineural suture." Some figures show the undoubted success of the procedure.

The most important principles of all post operative treatment are that the extremity should be properly splinted and the paralyzed muscles given daily massage and electrical treatments.

"It is advisable to keep the patient under observation until the muscles have recovered power. If for economic, military or social reasons it is impossible for the patient to remain in the hospital, he may be allowed to go about his work, reporting daily for the necessary examination and treatment."

H. G. Beyer.

Influenzal Sinus Disease and Its Relation to Epidemic Influenza, by H. E. Robertson, M. D., Major, M. R. C., U. S. Army, *Jour. A. M. A.*, May 25, 1918, pp. 1533.

This paper directs attention to a subject of interest alike to the specialist and the general practitioner. An "influenzal purulent bronchitis" assuming epidemic proportions and highly fatal having been observed at the base hospital zone of the British Expeditionary

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Forces in France as well as in the American Army zone, bacteriologic examination having confirmed its influenzal nature, the paper will, no doubt, also greatly interest military sanitarians.

But the author limits himself to a discussion of the "involvement of the sinuses at the base of the skull," its apparent frequency in postmortem findings and on account of the small amount of attention devoted to the subject in medical literature. Although infection of the accessory sinuses of the nose and skull have often been noted, sinus disease in epidemics of influenza has been either totally disregarded or described as an accidental complication or sequela of the infection of the pulmonary tract. "When, therefore, our first fatal case of influenzal tracheobronchitis and broncho pneumonia showed, at postmortem examination, an empyema of both sphenoid cavities, and the pus from these revealed by both smears and cultures, typical influenza bacilli, the condition was regarded as an interesting but unusual complication." As, however, case after case coming to necropsy showed similar or comparable lesions, the circumstances warranted more careful and detailed study.

The author then gives us a summary, in the form of abridged notes, of the necropsy examinations of fifteen cases. In but one of these cases of influenzal purulent tracheobronchitis the author failed to find sinuous disease, showing, apparently, the significance of the association of the sinuses in the respiratory type of influenza. We certainly must all agree with the author's remarks: "Inevitably in these days the question of carriers is linked up with that of actual cases, and, perhaps, too little consideration has been given to sinus disease as furnishing chronic foci for the spread of epidemics."

Every general practitioner must have experienced the annual recurrence of attacks of influenza in his patients having once been infected with it. We may not go far astray, in view of our author's observations, in assuming that many of our patients become chronic carriers of influenza bacilli, and that these bacilli find suitable quarters in neighboring sinuses, using them as summer resorts, meanwhile maintaining a proper balance between diminished virulence and a possible locally established immunity until a change of season again gives them the upper hand and a relapse occurs, a new center for the spread of the infection is created.

H. G. Beyer.

On Canned Food Stuffs and the Danger from Their Sale by Retail, by P. Carles (Ann. des Falsif. et des Fraudes, t. x, No. 99-100, Jan.-Feb., 1917, p. 49), abstr. in Arch. de Méd. et de Pharm. Milit., T. lxvii, No. 2, Feb., 1917, p. 272.

The cans, containing conserves, after removal from the autoclave and becoming cold, do not always present the same appearances. If their contents were well sterilized, the oxygen of the small amount of

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air that remains is absorbed, a partial vacuum results and the outside atmospheric pressure causes the two covers of the can to become concave. On the other hand, in case the organic contents had undergone fermentation, internal pressure from the gases produced by fermentations, would cause the covers to bulge out and become convex. They are then called mouldy (*floches*) and non-salable (*pas marchandes*). Some manufacturers consider such cans as lost, while others proceed to bore small holes into the covers, allow the gases to escape, reclose the openings and sterilize once more in the autoclave, the process being called "*repiquage.*"

When this process is applied to cans containing vegetables, and without any delay, it may not be hygienically objectionable, but when it concerns meats such as chops, liver, thymus, kidneys, game, etc., the consequences may be very serious, giving rise to indigestion, headaches and temporary enteritides. The process of "repiquage" presents another danger. In case the contents of such a can are not consumed within a few hours after the latter was opened, contamination by atmospheric germs may occur and their pullulation add still further to the toxic nature of such foodstuffs. The conclusion to be derived from all this is that, for individual use, it is best to utilize small cans, the contents of which may be consumed at one meal.

Although there is nothing new to military sanitarians in the above recital, it has not yet attained that degree of common knowledge among the extemporized and untrained cooks of our field and cantonment-kitchens so as to make a rehearsal of the above described simple fact entirely unnecessary. Cooks and kitchens are important links in the sanitary chain of camp sanitation, requiring daily inspections and constant watchfulness, if the training of our soldiers is expected to be progressive and lasting.

H. G. Beyer.

A First Apparatus for the Amputated,[1] by Baudet, Médecin major de 2m. classe. Arch. de Méd. et de Pharm. Milit., t. lxvii, No. 2, Feb., 1917, p. 245.

The author describes a simple apparatus applicable to the stump of an amputated forearm, still undergoing treatment in a general hospital and before the patient is passed on to a special center for reëducation. The case implies several important principles with regard to the subject of reëducation.

Given a case of forearm amputation below its upper third, and, supposing that either primary union had been obtained, or a corrective secondary amputation been performed and the stump was slowly healing under a dressing, the author puts around the limb a smooth layer of wadding up to the bend of the elbow. Over this layer of wadding

[1] With one illustration.

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he winds a plaster-of-Paris bandage as lightly and smoothly as possible, avoiding all constriction and so as to permit the attachment at the elbow end of the apparatus of two iron loops. In this manner a light and yet solid cast is obtained. After drying, the cast is slipped off, which is easily accomplished providing it was not put on too tightly, the wadding remaining adherent to the plaster and lining its entire cavity, forming, at the same time, a sort of negative of the antetrachial stump.

On to the conical end of this cast may be fastened a fork, a spoon or a hook. Their respective lengths are made dependent on the extent of the stump, their handles remaining either intact or being cut into strips 1 cm. long, and then fixed to the cast by plaster bandages. The open or elbow end of the sleeve is trimmed off in such a way as not to interfere with flexion at the elbow. Two small iron loops, permitting the easy passage of bands, likewise held in place by plaster bandages, are fastened on the radial and ulnar side respectively and thus complete the apparatus. The apparatus is easily put on and taken off. A bracelet of starch bandages around the lower third of the arm is put on to serve as a support. The broad bands, playing in the loops, are attached to the bracelet with safety pins. Losses in the power of pronation and supination are compensated for by appropriate bends in the handles of the instruments. Similar apparatuses may be devised for stumps of the lower extremities.

For the reviewer, the chief interest in apparatuses of this kind centers in their realization of important principles with regard to the reëducation of the handicapped and among which the time factor is admittedly a dominant one. An early beginning means a speedy end to an accomplished reëducation. The keeping alive of the nervous and muscular machinery during the process of healing is the ideal to be aimed at. The patient's interest is only second in importance to this, while the orthopedist will find his work over half done through such preliminary and timely preparation.

H. G. Beyer.

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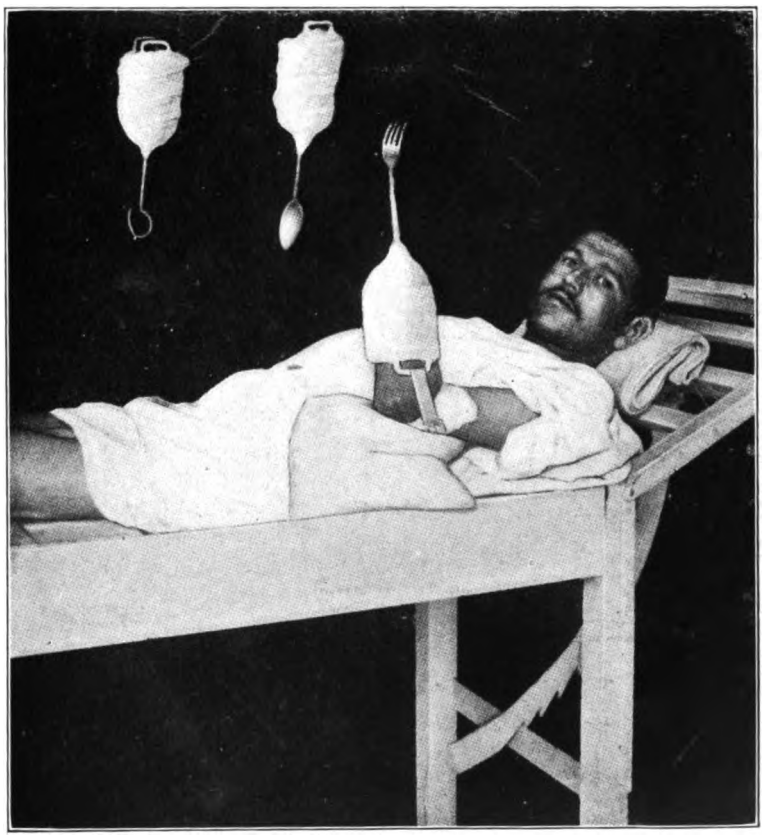

A First Apparatus for the Amputated.

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BOOK REVIEWS

REVIEW OF WAR SURGERY AND MEDICINE, prepared in the office of the Surgeon General, Vol. 1, No. 4, June, 1918, Washington (61 pages). Contents: (1) War Wounds of the Lung, pp. 1–26; (2) Methods of Dealing with Hernia in the Army, pp. 27–30; (3) Salivary Fistulae, pp. 31–38; (4) Injuries to the Nasal Cavities and Sinuses, pp. 38–44; (5) Dysentery, pp. 45–47; (6) Streptococcus Infections in Camps, pp. 47–51; (7) Abstracts from Ophthalmological Literature, pp. 52–57; (8) Laboratory Studies, pp. 58–61.

The largest number of pages of this number is covered by *War Wounds of the Lung and Injuries of the Chest.* The dominant note sounded and to be perceived throughout a study of this most excellent composite abstract, derived from the best and most recent sources, into the details of which this is not the place to enter, appears to be to the effect that war injuries to the lung and chest may be slight or severe, simple or complicated, aseptic or infected, attended by hemorrhage or free from it, and that such injuries as are met with in this part of the body must be diagnosed, prognosed, judged and treated in accordance with the same scientific, practical and common-sense principles of medicine and surgery combined as are war injuries to other parts of the body. It is clearly to be seen that, as time, observations and practical experience, aided by carefully taken statistics, go on accumulating, surgeons are gradually becoming more and more courageous and more and more skilled in the methods of handling the exceptionally delicate, injured contents of the thoracic cavity and in a more adequate treatment and with due regard for their important and special functions, the one particular respect in which treatment of such injuries must, naturally, always differ from that of injuries to other parts of the body. The outlook for the successful treatment of lung injuries seems to become brighter and much more encouraging than it seemed to be at the beginning of the war. Under the stimulating necessities of war conditions, progress in medicine and surgery has taken more rapid flights, just as in other fields of human activities, than under the more normal conditions of peace.

The methods of dealing with hernia in the army have been placed in the limelight. The new method of operating for hernia, recommended by Lieut. Col. Alfred J. Hull, appears to have caused quite a little stir among other experienced herniotomists and not to pass unchallenged.

The experience of four authors on the treatment of *"Salivary Fistula"* is summed up as follows:

Glandular fistulae.—(1) For slight or moderate discharges—immobilization of the jaws, with or without cauterization. (2) For moderate or more obstinate cases—cauterization, or creation of an arti-

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ficial opening into the mouth by transfixion of the cheek. (3) For persistent cases that do not respond to other treatment—resection of the auriculo-temp. nerve.

Fistulae of Steno's duct.—(1) For cases in which an appreciable segment of the posterior end of the duct can be freed—transplantation of the duct into the buccal mucous membrane. (2) For cases in which the situation of the fistula and scar tissue do not permit freeing of a sufficient segment of the posterior end of the duct—creation of an artificial opening into the mouth by transfixion of the cheek. (3) Where internal drainage of the parotid cannot be brought about—permanent occlusion of the duct by ligature.

Under *"injuries of the nasal cavities and sinuses"* the authors seem to lay stress upon the absolute necessity of a knowledge of the anatomy of the parts, a necessity which will be acknowledged by all those who have merely just witnessed such injuries, from which even the boldest and most hardened surgeon could never hold his profound sympathies in check. The multiplicity of small bones and sinuses, their contents in projectiles, teeth, pieces of clothing and extraneous matters is often alarming.

Attention is directed, in this abstract, to the dangers of general anesthesia, and, therefore, the details of the technique of local anesthesia are given with great thoroughness. "This form of anesthesia is adopted for: First, radical cure of maxillary sinusitis; second, radical cure of traumatic maxillary sinusitis; third, paradental cysts either within the sinus or not; fourth, foreign bodies and projectiles within the sinus. The removal of foreign bodies is facilitated by operating under the fluoroscopic screen."

In the three pages devoted to the subject of *"Dysentery"* the abstractor has tersely condensed all that is at present known of both bacillary and amebic dysenteries, their diagnosis, treatment, prevention and dangers. Special attention is directed to carriers of cysts, when employed in handling food. Dysentery in our camps is looked upon as a serious problem in consideration of the fact that many of our soldiers on the Texas border must have been carriers and are now distributed throughout the country. The danger of the fly as a carrier of living germs is emphasized.

The account of the recently observed *"Streptococcus Infections in Camps"* appears to amount to the sounding of a danger signal of considerable importance. The peculiar form of pneumonia, following measles, different from lobar pneumonia, its fatality, its constant association with *streptococcus hemolyticus,* the empyema accompanying it and its tendency to infect neighboring organs and tissues (meningitis and mastoiditis) should prepare us for meeting a grave and unexpected danger to our troops!

Specialists in ophthalmology will be interested more particularly in

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what the abstractor has to report on *"Ocular Manifestations of Icterohemorrhagic Spirochetosis,"* a disease of frequent occurrence in the field, especially the trenches.

Under *"Laboratory Studies,"* some new methods of work in various fields are described, among which the one for staining the *spirochaeta pallida* in smear preparations appears to be of special interest.

H. G. BEYER.

STUDIES IN THE ANATOMY AND SURGERY OF THE NOSE AND EAR, by Adam E. Smith, M. D. New York: Paul B. Hoeber. Price, $4.00 net.

Commencing with the chapter on the "Importance of Nasal Breathing" and continuing with suggestions on the treatment of intranasal conditions in which emphasis is laid on thorough cleansing of the nasopharyngeal spaces by gargling and evacuating the sinuses by suction, the author proceeds to illustrate the anatomy of the accessory sinuses by a number of very interesting plates. In a résumé he discusses most advantageous incisions for exposure of the sinuses and ethmoid cells, as well as the exposure of the interior of the nose.

The anatomy of the pituitary and the operative procedures for its exposure and removal are briefly treated. In dealing with otitis media and mastoiditis, stress is laid upon the postural treatment; and it is the author's opinion with the patient lying face downward, the forehead and one cheek supported by pillows, nose and mouth and one eye free, perfect drainage can be secured. The plates and drawings illustrating surgical procedures on the temporal bone are very plain and show the points of interest. A system of division of the mastoid process into four equal parts, evolved from the plan recommended by Hartley, is given: The temporal ridge or a line continuous with the zygomatic arch is taken as the upper boundary; the posterior boundary is a line drawn vertically from the junction of the posterior border of the mastoid process where it meets the occiput, and the lower boundary with a line drawn backward from the tip of the process. Dividing this into four equal parts, it is found that the upper anterior quadrant opened into the antrum, the upper posterior into the lateral sinus, and the two lower quadrants into cells, while deepening the lower posterior quadrant will open into the descending limb of the lateral sinus.

Considering the small size of this book, it is very complete and well gotten up.

G. B. TRIBLE.

DISEASES OF THE CHEST AND THE PRINCIPLES OF PHYSICAL DIAGNOSIS, by Norris and Landis. Philadelphia, Pa.: W. B. Saunders Company. Price, $7.00 net. Half-morocco, $8.50.

In this very handsome octavo volume of 782 pages, Part I, Examination of the Lungs and Circulatory System, is written by Professor Norris; Parts III and IV, which deal with the diseases of the lungs and of the heart and aorta, are written by Professor Landis. A chapter

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upon the Electrocardiograph in Heart Diseases is contributed by Professor Krumbhaar. The authors state it to have been their aim to write a practical book on the physical diagnosis of the heart and lungs in health and disease, omitting everything not of practical diagnostic use and condensing methods of secondary importance. The result is what was to have been expected from the eminence of the authors. The work is a mine of information upon the common diseases, with a sufficient reference to more unusual conditions which demand notice for the sake of completeness in the presentation of the subject. The acoustics of the chest is a subject which is treated with unusual thoroughness, the authors basing their treatment of the subject upon the classical work of Geigel and the valuable articles of Montgomery.

The book is profusely illustrated, there being in all 413 illustrations, which present, by means of diagrams and very numerous and excellent photographs, every feature of the subjects under consideration which can be elucidated to the eye. The book is dedicated to Professor Fetterolf, whose valuable work in the anatomy of the lung is well known, without whose coöperation the authors say it would lack what is probably its most characteristic feature, and indeed the very numerous illustrations of frozen sections add much to its value and distinction.

The aim of the writers may be said to have been attained in furnishing to the medical profession a practical and at the same time in the main a thoroughly scientific presentation of their important subject. Where this is so much that is worthy of praise it would be invidious to criticize details. There is one matter of considerable importance, however, to which the reviewer feels it desirable to refer. On page 331 allusion is made to the fact that the error of separating physical from symptomatic diagnosis still persists; further that physical signs, while often indicating the extent and degree of pulmonary damage, convey no direct information as to the pathological nature of these changes. Now physical signs do not, of course, indicate the nature of the affection as respects the causative agent, but apparently that is not the idea that the authors seek to convey, for we read, on page 352, signs of a healed or arrested lesion (of tuberculosis) differ in no respect from those found in the early active stage of the disease. The question of activity will rest on the presence or absence of symptoms. The authors are by no means alone in holding to these views, but considerable experience, corroborated by autopsy findings, convinces the reviewer that it is possible to distinguish with ease between healed and old lesions on the one hand and recent and active lesions on the other. If it were not so, one might well inquire of what value our physical diagnosis is in this important field. The point concerning which we differ is chiefly this: the rôle of auscultation in revealing the indurative changes of fibrosis. For the authors apparently bronchovesicular breathing is, chiefly, dependent upon inflammatory infiltration, whereas in the chronic form of tuberculosis this type of breathing is due with

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far greater frequency to fibrous induration, the extent of which it is capable of revealing with really extraordinary accuracy.

GEO. E. BUSHNELL.

RECLAIMING THE MAIMED—A Handbook of Physical Therapy, by R. Tait McKenzie, M.D., Major, R. A. M. C., Professor of Physical Therapy, University of Pennsylvania. New York: The Macmillan Company, 1918. A book of 124 pages, 115 illustrations, 8vo. Price, $2, with index.

This excellent manual gives in a brief but comprehensive manner the elements of physiotherapy, especially as related to the physical reconstruction of the disabled soldier. Dr. McKenzie is something more than a theorist in his treatment of the subject. His work is founded on an experience of more than a year as medical officer in charge of a "Command Depot" in England and as inspector of similar institutions for the treatment of convalescents throughout Great Britain. In addition he made a tour of inspection of Canadian convalescent hospitals for the purpose of standardizing the teaching and practicing of physical therapy. Moreover, as is well known to all students of the subject, he is an authority on the reëducation of extremities rendered more or less useless because of weakened muscles and stiff joints.

The manual deals with a variety of therapeutic measures—medical electricity, the use of radiant heat and light, hydrotherapy and massage—especially in their application to war wounds and injuries. It is, however, chiefly in relation to apparatus as a part of mechanotherapy and in gymnastics and athletic games in their relation to the functional reëducation of the disabled that the author is best known.

The reviewer, at Hart House in Toronto, had an opportunity of witnessing the application of Major McKenzie's ingenious apparatus and devices for these forms of therapy, and he believes that every student of the subject should study carefully chapters seven, eight and nine of this small text-book.

Dr. E. A. Bott, in charge of the activities of Hart House, was quite enthusiastic over the experiments and research operations instituted by Major McKenzie.

The final chapter of this work is devoted to the masking of facial deformities. These distressing cases are not uncommon in military surgery and are well worth the study of the reconstructionist.

CASEY WOOD.

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CLINICAL AND LABORATORY NOTES

PROPHYLACTIC TREATMENT OF DISEASES OF RESPIRATORY TRACT[1]

By 1st Lieut. BENJAMIN H. MINCHEW, M. C., U. S. A.

In the following article are set forth some of the conditions which, to our mind, are responsible for a great number of the throat inflammations, the diseases which follow, and the precautions and treatment to obviate them. So many causes contribute to the infections and inflammations of the throat that it would be impractical to try to name all of them. We therefore will deal only with the conditions which have affected the personnel and patients of this institution.

From about December 1, 1917, to January 20, 1918, this section of the country experienced the severest weather in its history. Ordinarily the temperature seldom falls below 20°, and many winters pass with only a thin sheet of snow during the entire season. This season, however, we had zero weather and below for several days at a time, and the ground was covered with snow to a depth of 10 to 20 inches for the entire period named above. For many days dense clouds covered the skies and no sunlight whatever was enjoyed during this period. The personnel of the hospital corps who, ordinarily, would have been doing outside work, were kept indoors, and even the ward attendants spent as little time on the outside of their wards and barracks as possible. The drilling of the detachment was abandoned on account of the snow, and even the "setting-up" exercises were dispensed with for the same reason.

The majority of our cases were transfers from a nearby cantonment, convalescing from measles, mumps, scarlet fever, pneumonia and other diseases which go hand in hand with inflammations of the throat and respiratory tract. The nursing of these patients at this time was performed entirely by the enlisted men of the Medical Department, most of whom had recently entered the service from civilian life and had very little knowledge of the necessity or methods of precaution against contagion. Regardless of the instruction given them concerning their protection in the wards, it was probably heeded for a few minutes and then forgotten. All these men slept in the same barracks with the other men of the detachment, who, weather conditions permitting, were doing outside work.

[1]Fort Logan H. Roots, Arkansas, Army Hospital, Eye, Ear, Nose and Throat Department.

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With the above related facts in mind, it will not be surprising to find that about January 1, 1918, we had an outbreak of tonsillitis and pharyngitis among ward attendants and a few cases among the members of the detachment who were contacts with them. At this time we had only about 80 men composing the enlisted personnel of the hospital, of whom as many as four or five were reporting each morning at sick call with sore throat, and it did not require many days for it to become a serious problem as regards help. To overcome this threatened epidemic, each patient was isolated and watched carefully, as will be described later. We felt, however, that this would not be sufficient to stamp out and prevent other cases occurring from the indirect contact of the men who had been sleeping in the barracks with those men already sick. Considering, then, every man in the detachment a contact, every enlisted man was ordered to the eye, ear, nose and throat dispensary and a smear was secured from the throat which was sent to the laboratory for examination, a report of which will appear under proper grouping. Morning and afternoon sprays of dichloramine-T were instituted and continued for ten days. After the third day of this method of prevention was started no new case of tonsillitis or pharyngitis developed. In other words, the epidemic was controlled by simply treating that group of men who were indirect contacts but who would have undoubtedly developed throat inflammations.

About the time we had this outbreak under control and the ward attendants returning to their duties, 100 new men joined the detachment; these men were assembled at one of the army posts several hundred miles south of this post, coming from different recruiting stations over the country, both north and south; some of them had been exposed to the severe weather in the north and had traveled several days en route to the assembling point. The men coming from the south had already experienced the hardest weather known to their section. All had traveled in unheated, poorly ventilated day coaches from the assembling point to this post. It is easy to imagine what we expected to find in the way of acute inflammations of the respiratory tract, with men undergoing these hardships. It was easy to see another epidemic akin to the one we had just experienced. Immediately upon their arrival they were ordered to their barracks and a throat smear secured from each man. Quite a number of them had acute coryza and acute inflammation of the throat, but it was surprising that more severe conditions did not exist; these men were sprayed night and morning for ten days, and it was amazing to note how, after but two days' treatment, the

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condition of all improved and it was only necessary to place one man in bed as a patient; this man had peri-tonsillar abscess. No new cases of sore throat developed among them, and the full quota of the enlisted personnel of this institution has been practically free from acute affections of the throat since that time.

The report from the laboratory, which will follow, was rather surprising to us. The older men of the detachment had been well quartered, sleeping in brick barracks, steam-heated, well-ventilated and every effort made for their health and comfort. Nearly everyone, however, came in daily contact with the patients in the wards, the character of whose diseases, already mentioned, showing a large percentage of inflammations of the respiratory tract. The new arrivals in the detachment had undergone exposure to the extreme cold, had been housed in tents and crowded barracks, and had traveled in poorly ventilated, stuffy coaches, but were not contacts with the diseases mentioned above. Listed below is the report of the results of the examinations from the laboratory, under Groups A, B and C, with explanations which will show their proper classifications. These examinations were made with the microscope only, and all mention of the pneumonococci is based on the morphological resemblance of this organism to the predominating diplococci found.

Group A.—Smears from the tonsil surface of ward attendants with acute inflammation of the throat, direct contacts with measles, scarlet fever and pneumonia. This group showed 96 per cent definite organisms of all smears. Diplococci, resembling pneumococci, appearing in 82 per cent of the positive findings. Streptococci, staphylococci, influenza bacilli appearing in relative percentage. Vincent's organism found in one case.

Group B.—Smears from members of the detachment who were contacts only with group A, indirect contacts with ward patients, but none had acute inflammation of the throat. These smears showed definite organisms in 62 per cent of all slides. Diplococci, resembling pneumococcus, 79 per cent of all positive findings; other organisms appearing as in group A with the exception of Vincent's organism.

Group C.—Smears from members of detachment who had recently arrived from other posts, exposed to severe weather, traveling in crowded and poorly ventilated railway cars, but not direct or indirect contacts with the infectious diseases mentioned in group B. This group showed only 41 per cent definite organisms. Diplococci, resembling pneumococcus, found in 74 per cent of all positive findings, streptococci, staphylococci, influenza bacilli appearing in relative proportions. One diphtheria carrier found in this group.

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At the time of this report the laboratory was not equipped to do culture work; therefore it was impossible to show, positively, the pneumococci or the different types of this organism, but from the fact that pneumonia had been the prevailing disease at all camps this winter we do not doubt the accuracy of the laboratory report of the microscopic findings. These findings bore conclusive evidence to us that direct contact with the acute inflammations of the throat and the contagious diseases which produce relative infections were responsible, in large measure, for the epidemic mentioned in the opening of this article. We learned also that weather conditions which will not permit a proper amount of outdoor exercise, or provide a sufficient amount of sunshine and fresh air, have much to do with the resistance afforded this contact. It was evident, too, that indirect contacts, as mentioned in Group B, regardless of weather conditions, were more susceptible than those whose duties kept them in the open, even in more severe weather conditions. This report also shows that the relative crowding of men, poor ventilation, exposure to severe weather, does not show the same high proportion of infections as direct or indirect contact under better conditions.

Concerning the handling of those suffering with acute tonsillitis and pharyngitis as regards treatment, we wish to state that all were treated, in the first place, as suspects of measles, mumps or scarlet fever; determined by wards and character of patients they had attended. They were isolated in a building providing for one man only in a room until this building was filled, when the overflow was placed in private rooms connected with the ward in which the individual had been nursing, and were isolated long enough to determine that no complications would arise from their previous contact with infection in the ward. The throat was treated as the severity of the case indicated, either by mild astringents or a more drastic cautery, but all were sprayed with aqueous solution of chloramine, followed by the oily solution of dichloramine-T. The patients were sprayed, nose and throat, in a recumbent position, or with head reclining; this position allowed the solution to flow back over the turbinates and the free chlorine to penetrate the sphenoidal, frontal and ethmoidal cells. All these cases ran the usual acute throat course, excepting five, in which peritonsillar abscess developed.

We were not content with treatment alone, as the report showed a dangerous possibility to deal with; this danger was not only to the patient but to the attendant, and existed in the barracks as well as the wards. We instructed the detachment as a whole, impressing

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the importance of the toothbrush and the daily use of a cleansing mouth-wash. The heads of the beds in the wards and barracks were alternately reversed. All men were ordered to report promptly at sick call or any time during the day in any case of sore throat or inflammation of the nose or respiratory tract, no matter how simple.

Paper bags were employed for the deposit of all sputum and waste matter, the bag hanging by adhesive straps within the reach of the patients, and they were instructed to "catch the sneeze," expectorate on a paper napkin and deposit it, after folding, in the paper bag. The nurses and orderlies were instructed in the handling of these bags, which were folded so as to prevent a bellows-like blowing of the contents into the face, which also was protected by a gauze mask. The ward surgeons and all attending nurses wore operating gowns in their work in the wards, and visitors were required to do likewise. No examination of the nose or throat is made or treatment given without a protection of a gauze mask over the nose and mouth of the attendant. We have tried to popularize the removal of tonsils from all members of the nurse corps and the detachment by the most painstaking operation and after-treatment; we are succeeding in a large measure in this effort by making an almost painless operation and immediate care after the operation, which proves of very little inconvenience to the patient.

The measures employed above have, undoubtedly, borne fruit, as the throat inflammations have been reduced to a minimum and we have had only one case of pneumonia to develop in this organization since these methods were instituted. This percentage of our strength gives four cases per thousand, which is a small percentage when it is considered that about 50 per cent of this unit is in daily contact with transfer cases of infectious diseases, which carry a large percentage of contagious throat inflammations.

With our experience here and the common information concerning the camps throughout the country, we have come to believe that too little attention is paid to the simple conditions arising in the nose and throat. We have demonstrated the presence of active organisms in all stages and conditions on the mucous surface of these organs, and we have come to consider that there is the same hazard in the secretions from the inflamed surface of the nose and throat, sneezed or coughed on to the mucous surface of another patient or nurse, as in transferring a recognized organism from an infected wound of one person to a supposedly clean one of another.

Conclusions.—(*a*) Pneumococci were the prevailing organisms

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to deal with in the recent inflammation of the throat. (*b*) Contact adds greatly to the rate of infection. (*c*) Isolation should be enforced even in mild forms of nose or throat inflammations. (*d*) The protection of the nose and throat of all attendants coming into contact with these conditions should be insisted on. (*e*) All tonsils, after an acute or chronic inflammation has affected their structure, should be removed. (*f*) All cases showing inflammation of the nose or throat should have all fresh air and sunshine possible. (*g*) No acute throat, no matter how simple, should be treated in "quarters." (*h*) Smears should be secured in all throat inflammations, cultures made and organisms determined. (*i*) Contacts should be treated when epidemics arise, thereby preventing its spread. (*j*) Pneumonia can be largely prevented by active and early measures in the treatment of all throat infections and contacts.

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ORIGINAL ARTICLES

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MEDICAL WORK WITH THE AMERICAN EXPEDITIONARY FORCES[1]

BY MAJOR ROBERT B. OSGOOD

Medical Corps, United States Army

I HAVE been asked by the Surgeon General to briefly outline for you this morning the organization of work in the different professional divisions of the American Medical Expeditionary Forces. The headquarters of these divisions are not at the same place as the general medical headquarters, but the association of the different professional divisions with each other is most intimate. They occupy rooms in one building having a common adjutant and pool the automobiles assigned to them. Just before I left a scheme was broached of them having a common mess which would bring them in still closer touch with one another. Scarcely any recommendation goes up from any of the divisions without the approval of the other divisions, and a divisional matter which is likely to affect the other groups is most carefully discussed among them. Their relationship is most cordial, and one finds an almost complete absence of petty jealousies.

Considering now the activities of the different professional divisions, we may discuss first the pre-combat period.

Casual surgical and medical cases of course occur in small numbers. They are sent to the base hospital and the treatment of these cases concerns all the professional divisions, but chiefly the medical division now well organized under Colonel Thayer and Major Boggs. It was found, in the first combat divisions which came over, that a very large number of mental defectives were included in their ranks, and the activities of the division of psychiatry became at once im-

[1] A lecture given to the officers of the Office of the Surgeon General U. S. Army.

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portant. Major Salmon is at the head of this division, and his work is recognized as being of much importance and adding greatly to the efficiency of the Army. It is impossible to speak in too high terms of his ability and resourcefulness.

The genito-urinary problem, under Major Young, is presented as soon as the troops are landed and is therefore obviously a pre-combat activity also. Major Young is attempting by far-reaching methods to control the treatment of syphilis much more particularly than it has been controlled in other armies. Only six weeks of treatment has been the routine, and Major Young feels that at least six months of continual treatment must be administered consecutively if anything like a complete cure is to be accomplished. He has arranged to have this carried out by special mobile units near the front, so that the men can have their treatment without leaving the camp area.

The division in which my own work has been done is the division of orthopedic surgery, and somewhat to the surprise of all of us, and not least to the division of orthopedic surgery, pre-combat work of the division has been much larger than was anticipated. It was found, in the first combat divisions which came over, that there was an extraordinarily large percentage of men, perhaps from 15 to 20 in many regiments, who were not fit for combat on account of foot strain, faulty shoeing, back conditions and inability to stand regular military training. These men had been sent over very quickly and under hard training fell down. Because they were not fit for regular duty, they had reported on sick call and were sent to a base hospital. These base hospitals, after resting them a few days and finding no infectious diseases or acute surgical or medical conditions, sent them back to the camps, where they would again report after a few days on sick call and be sent again to the base hospitals. They were beginning to be discouraged men, for although they themselves knew they were not "quitters," they were being considered so in many instances, and in any event they were useless to the Army. Colonel Bevans, of the 26th Division, suggested to Major Goldthwait that possibly many of these men might be made fit for combat duty or at least saved for the Army in some capacity, if a military training could be given them under line officers, but also under the medical supervision of orthopedic medical officers. The experiment was started in a small village and proved successful beyond any anticipations. After three months it was found that something like 80 per cent of the men could be returned to combat duty after an

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average gradual training of about six weeks, and that about 90 per cent could be made fit for work in some capacity in the Army. These figures are conservative, but, even if only 50 per cent could be so reclaimed, it would be quite worth while doing so if the conditions of transport remain as difficult as they are at the present.

The experiment proving a success in a special division, the first corps requested that this training battalion be made a corps affair, and a recent decision broadens its activities still further and makes it an A. E. F. activity. The commanders of base hospitals are allowed to transfer suitable cases directly to this training battalion. Starting in December, it was made more inclusive in April, and a new location near depot headquarters selected. Barracks for five thousand men are now being prepared.

MEDICAL WORK IN THE COMBAT DIVISIONS

When the division goes into action, the medical necessities change, and recent advances in surgery have made the present activities of the medical department of combat divisions somewhat different from those that existed formerly. The most acute attention is being focused on getting the cases back to the evacuation hospitals in the best possible condition and in the shortest possible time. Practically no surgery, except the stopping of hemorrhage, the halting of a case in shock and an occasional abdominal or chest emergency is done in the field hospital or the advanced dressing stations.

The venereal problem exists in these combat divisions, as does the problem of shell shock and the other psychiatric cases. It becomes of enormous importance also in diminishing shock, preventing displacement and saving suffering, to have the fractures and joint injuries efficiently splinted at the earliest possible moment.

The three professional divisions therefore which are represented by their specialists in the combat divisions are genito-urinary, psychiatry and orthopedic surgery. If the cases reach the evacuation hospitals within ten or twelve hours of receipt of their wounds, it is possible, as you know, by the methods described and made practical by LeMaitre, to perform primary, delayed primary and secondary suture on nearly 90 per cent. Recent figures from our own Evacuation Hospital No. 1 have shown that already the American surgeons were obtaining nearly 90 per cent of such successful closures. Having been personally an absolute skeptic as to this type of surgery from an earlier experience in 1915 with the French and a later experience in 1917 with a British general hospital, conviction

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has only come after personal observation. This conviction has perhaps been made more firm by former skepticism. When one thinks of the saving of time and of nursing, the saving of dressing materials and treatment and, most of all, the saving of suffering to the soldier, the value of this revolution can be somewhat appreciated. Of course the effect on future deformity and crippling will be at once evident.

The quick return of the wounded to the evacuation hospital, where the most skilled surgical service can be rendered, thus diminishes the surgery done in the field hospitals and limits it practically to emergencies only. In August, 1917, it became evident to those of us interested in splints and who had been working in the British hospitals that we could probably standardize our splints and limit their number to a certain few patterns. This seemed of great importance since many of our regimental and other medical officers had been unfamiliar in civil life with the most efficient types of military splints, and many of them had given little attention to fractures. The Chief Surgeon, General Bradley, appointed a Splint Board of six members, of which Colonel Keller of the Regular Army was chairman. This board agreed very quickly on a standardization of the splints, limiting the number for use at the front to seven, and, at General Bradley's suggestion, wrote a manual which, after it had been approved by the chief surgeon and by General Pershing, was published in England, the financial burden being borne by the American Red Cross. This edition of 25,000 is distributed through the Medical Supply Depots to all medical officers abroad. We were successful in getting this into the hands of our medical officers before any real battle casualties occurred.

With this manual as a text, Maj. Nathaniel Allison, whose activities in the Division of Orthopedic Surgery covered the combat divisions and the field hospitals, has drilled the stretcher-bearers and the regimental officers in the application of these splints so that at the present time I think it is fair to say that we are succeeding in having them well applied as early or earlier than any of the other armies. The general lines of the British splint drill have been followed out and, as you know, the record of the British army for applying a Thomas leg splint with all the necessary accessories is two minutes, and the recognized time which all stretcher-bearers are expected to better is six minutes.

The wounded men with fractures are coming back in splendid shape to the evacuation hospitals. Thus far the splinting has been excellent.

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In the evacuation hospitals the surgery is almost wholly that of emergency surgery and must be entirely in the hands of the general surgeons, who should have absolute sway, the different specialists being asked to come in for consultation as they are desired.

Colonel Finney, as chief surgical consultant, and his assistants, Major Peck and Major Fisher, have organized surgical teams of great efficiency and skill, drawing them chiefly from base hospital units. You all know and love the personalities of the chief surgical consultant and his assistants too well to make it necessary for me to speak of the wisdom of his choice or that of his assistants.

The Division of Roentgenology under Major Case is furnishing excellent service and working out a scheme for transmitting X-ray records with the patient in his varied journeyings. There are adequate plants in the evacuation hospitals. The number of our own evacuation hospitals thus far has been small, since so many of our troops have been brigaded with the French and British, who have been responsible for the early treatment of the wounded.

In times of push of course the necessity of moving back cases very quickly prevents such a high percentage of early closures from being attained as is possible in times of comparative quiet. In the recent pushes, when many of the evacuation hospitals were either captured or shelled, there were sent back many wounded who had been for three or four days with only the emergency first-aid dressing applied.

When the cases can safely be removed from the evacuation hospitals, they go back either to the base hospitals of the advanced zone, the special hospitals of the advanced zone, or sometimes directly to the base hospitals of the intermediate and base zones. The special cases of bone and joint injury are segregated as far as possible and sent to special bone and joint hospitals. One is already established in the advanced zone and several others in the intermediate and base zones. In the advanced zone these are known as bone and joint hospitals, and may have as their senior medical officer either a general surgeon skilled in bone and joint conditions or an orthopedic surgeon qualified to deal with fractures. In the advanced zone there are also special psychiatric and genito-urinary hospitals. From the base hospitals in the advanced zone, cases of amputation are sent to a special center and segregated. There the early treatment for weight-bearing is begun.

An enormous loss of time and labor to a nation is suffered when large numbers of cases wait much longer than the condition of their

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stumps requires for the fitting of the artificial limbs. In one of the belligerent countries, there are probably, at a conservative estimate, 10,000 men waiting for more than six months longer than necessary for the fitting of the limbs. When one realizes that this represents, in actual time lost to the nation, the entire labor of a man for 5,000 years, one begins to see the importance of the economic waste. At Base Hosiptal No. 9 such a center is already established under the direction of Capt. Philip Wilson, a man of large surgical experience and fine training in the artificial limb problem through a long service in the Red Cross Bureau of Mutilés. Here the cases are fitted to pilons and to temporary limbs with the same joint mechanism as the permanent limbs and a consecutive training without waste of time is begun, to be continued on this side, where a more permanent and finished limb will be applied. By the time the stumps are ready for their final most perfect mechanism the men should be ready for wage-earning also.

Thus, in so far as possible, the radial control of different types of cases is being worked out and a well-qualified man placed in charge of a line of hospitals, so that continuity and similarity of treatment may be administered from the front to the rear.

In the bone and joint cases, at Colonel Finney's request, the responsibility for the end result has been placed with the Division of Orthopedic Surgery, to whom the long-standing cases originally come in the special orthopedic hospitals. It does not mean that the orthopedic surgeons have entire charge or care of these cases. Perhaps they have been more accustomed than general surgeons to determine whether the greatest amount of function which it is possible to obtain by any form of treatment has been gained in a given case. It seemed fair, therefore, to ask their consultation as to methods of treatment most likely to bring about the best possible result. The "check-up" of the cases is the important thing, and in this work my experiences were extraordinarily pleasant in going about the various base hospitals of the intermediate and base zones and consulting with the various surgical and orthopedic men stationed in these hospitals. It was apparent that all cases were being handled extremely well, and we may hope at least that our burden of preventable cripples will be lightened.

We should like to emphasize again the general atmosphere of team play which exists among the professional divisions on the other side. No one wishes to be considered, over there, a specialist, except in so far as his previous training has made it possible for

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him to render one type of service better than another. His attempt is simply to try to find the road along which he can travel and perform the best service to the soldier. This intimate association and free discussion that the different professional divisions have with one another engenders this spirit of team play and makes the various suggestions which go up through the director of professional divisions to the Chief Surgeon, much easier for him to handle and much more likely to be carefully thought out, since they represent more or less a unanimous opinion. From the chief surgeon down, the attempt is being made to judge the work by a certain standard. Bringing the soldier to his greatest possible efficiency in the quickest possible time is the criterion by which methods are judged.

There are gradually being established, in orthopedic centers, curative workshops. Very little in the way of vocational training for our men is being planned in France, but with the present attitude of the Expeditionary Staff toward keeping the man once over on the other side, provided he can be rendered useful in some category, something in the way of occupational and curative work must be established. A certain amount of very simple mechanotherapeutic apparatus is installed in these centers as well.

The psychology of the wounded men is of the greatest importance. In Great Britain much time and labor have been wasted in persuading the men to take the curative work. By the time they reach the chronic hospital or orthopedic center, there is a great inhibition toward further treatment. In order to overcome this difficulty and lower the threshold toward future vocational and important occupational work, the bedside occupation aides have been sent for and will be of great importance, we feel, in the early days. Everyone who comes in contact with the severely wounded soldier, who has been through hardships and suffered and has emerged in a more or less crippled condition, recognizes the importance of beginning, as soon as possible, to combat the idea of crippledom and to awaken and foster a spirit of future usefulness. If at this stage the soldier can be given something to do with his hands and to occupy his mind as well, and he can come in contact with a stimulating personality who is not a soldier and who will not talk battles with him, he gains comparatively quickly the conception of a possible wage-earning capacity and a return to a useful place in the body politic. He recognizes that his duty to the nation does not end with the end of his fighting and that his disability is a disability to be overcome.

There were being established, just as I was leaving, convalescent

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camps, in which much of the military discipline of the training battalions was being instituted. More careful medical supervision than in the training battalions is necessary, but practically no nursing care. The regime corresponds closely to the command depots of the British system.

In closing, let me say that the contact with the regular officers in the Medical Department of the Army has been most stimulating. An abler, more coöperative or kinder group than that which surrounds the chief surgeon would be very hard to find. They have been most patient with us newly made military men, and have seemed to recognize that the many mistakes we have made have been those of ignorance and not of intent. They have given us every help and support and made us very eager to be of service to them and to our soldiers.

General Richard: I believe we all appreciate most thoroughly what Major Osgood has said and I wish to thank him on behalf of the assembled audience for his very fine exposition of the organization and the character of work, under that organization, that is being accomplished by our Medical Department abroad. If any of you gentlemen wish to ask any questions I am sure Major Osgood would be glad to answer them.

Colonel ——: I would like to ask the speaker, in connection with his remarks in which he said that in England it is difficult to get the men into this curative workshop system, whether he considers that the semi-civic administration or the military administration of this work would be more effective.

Major Osgood: While the patient is in the military hospital, there is no question of having him under any control except that of the medical officers and the commanding officer of the hospital. Later on, when he becomes a discharged soldier, the Pensions Ministry or the semi-civic administration must take up the burden of his rehabilitation. Since this is largely voluntary on the man's part, it is far less easy to control him under this regime than while he is a patient in a military hospital, subject to the rules of that hospital and, generally, still retained in the Army, under complete military discipline. While in hospital it is often quite pathetic to see how eager the soldier is to get work of some kind to relieve the tedium of his hospital days. At first, while bedfast, it makes little difference what kind of work it is, though often some indication is given, if the work is varied, as to what line of vocational training the man is best fitted to follow later. The bringing in of occupational therapy and the lowering of the threshold toward the suggestion of the resumption of a wage-earning capacity is the great thing.

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THE FOOT PROBLEM

By 1st Lieutenant TOM S. MEBANE, M. C., U. S. A.

THE Camp Orthopaedic Service offers many problems for solution. Of these the most persistent, and by far the most important, is the management of foot cases. The purpose of this paper is to explain how this problem was met at Camp Beauregard and the results obtained.

The orthopaedic surgeon in charge of such a work has a double duty. He is responsible for the orthopaedic service for the camp, and for the organization for each Division of an efficient service that will be effective under field conditions. His camp duties are: Prevention of foot trouble, the elimination of the unfit, and the rehabilitation of men with remediable foot conditions. The first is accomplished by educational means, the second by examinations, and the third by the establishment of an orthopaedic camp.

Methods designed to prevent foot trouble are as logical and as fruitful as methods designed to prevent infectious diseases. Results are accomplished in the same way, *i. e.*, by educational means and by timely recommendation to higher authority. The orthopaedic surgeon has two duties in connection with line officers. He should see, in the first place, that they receive only "foot fit" men, and secondly that they thoroughly understand the principles of foot trouble prevention. This last he imparts in his lectures to them. When the line officer understands the dangers of improperly fitting shoes, he sees to it that his men are properly shod. When he is shown that, by sparing the men's feet and strengthening their foot muscles, they are rendered more efficient and cheerful, he will gladly act on suggestions. It is impressed on the line officers in this camp that the only acceptable excuse for foot trouble is trauma. They are taught that, when men entering the army with good feet have trouble, it is due to failure to apply the rules of foot trouble prevention. In this camp the measures to be taken to prevent foot trouble and the exercises to strengthen the foot muscles were included in the training schedule for the division.

There is a further duty in relation to the prevention of foot trouble that the orthopaedic surgeon should accept, and that is to see that the enlisted men receive proper shoes. The orthopaedic

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surgeon is the man who sees the results of badly fitting and poorly repaired shoes, and it certainly devolves upon him to call the attention of the proper authorities to this subject and to make recommendations as to how the work should be done. New draft men received in this camp have been fitted with shoes by specially trained men. By order of the commanding general all organizations leaving this camp must carry a roster of the size shoes required by their men to the port of embarkation.

In the elimination of the unfit, the orthopaedic surgeon must face a duty that involves judgment and willingness to accept responsibility. Unfit men allowed to enter organizations are a source of much trouble, both to line and medical officers, and a poor recommendation for the ability of the examining orthopaedic surgeon. The elimination of the unfit can and should be done at the time of induction into the service, to put it off until a later time is an unnecessary waste of time for officers and men. By doing the work systematically, two orthopaedic surgeons and four clerks can examine and record the results of one hundred foot examinations per hour. To accomplish this the men are examined standing on a table. The table should be high enough to come to the shoulder level of the seated surgeon. The men walk across the room and mount the table, standing in front of the examiner. The way he walks across the room and the way he mounts the table are an excellent index of the functional ability of his feet. By inspection the surgeon notes visible defects, then putting a hand on each foot the position of the scaphoid is noted with the thumbs. The toes are pushed up next, and any rigidity noted. Then the man is instructed to give his left foot to the examiner, holding the knee straight. The examiner's left hand explores the heel for any abnormality; the right hand grasps the forefoot and tests the functions of the subastragaloid and mid-tarsal joints. Lastly, the forefoot is pushed up, and the condition of the ankle joint and the tendo Achilles is noted. In this position the sole of the foot is inspected for callosities. The right foot is examined in the same way, except that the examiner reverses the position of his hands. Once this simple routine is mastered, the rate at which men can be examined is surprising. It is also very unlikely that the slightest defect escapes observation.

Six months' experience in examining the feet of white soldiers has taught very definitely the possibilities of the various defects. None of the following classes of foot defects are fit for active oversea service: (1) Flaccid flat feet with marked abduction or

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eversion; (2) rigid or spastic flat feet; (3) rigid arthritic or post-traumatic feet; (4) marked cavus; (5) pes varus or valgus following fracture; (6) extreme hallux valgus associated with painful bunion or metatarsalgia; (7) hallux rigidus; (8) amputation, partial amputation or severe derangement of the joints of the great toe; (9) proved exostosis of the undersurface of the os calcis.

The following types of cases can be accepted with the assurance that they can be made fit within a short time in the great majority of cases: (1) Flaccid flat feet without much abduction or eversion; (2) ankle valgus not the result of fracture; (3) poorly developed but not pathological feet. The third great class of cases, such as hallux valgus, uninflamed bunion, claw toes, hammer toes, ingrown nails, corns or callosities, etc., can be accepted with rare exceptions. These cases, if given properly fitted shoes and such minor chiropody as may be indicated, will develop no further trouble.

In the negro, the proposition is somewhat different. The statement that all negroes have flat feet is erroneous. Recent examination of 2,000 negroes showed that only about 40 per cent have flat feet, in the sense that the tubercle of the scaphoid is lower than normal. A much higher percentage appear flat, due to the large plantar fat pads and well-developed foot muscles. The foot of the negro differs from that of the white in its greater flaccidity. This is compensated for by greater muscle development. In the white and black the degree of muscular development of the foot bears an inverse relation to the tenseness of the ligaments. As flaccidity, or relaxed ligaments, is more common in the black, therefore we find the greater muscular development. Many negroes with flat feet associated with abduction and eversion had no subjective symptoms and so were accepted. Only the cases where rigidity was present were rejected on account of flat feet.

Men with defective feet are handled in the foot camp. This, in the new scheme of things, will be a section of the development battalion. The men in the camp comprise those taken from organizations because of inability to perform their duties on account of foot trouble, and those accepted in the last draft with remediable foot trouble. As the work becomes more thoroughly organized there should be few of the former. The purpose of the camp is to observe and treat all foot cases, determining by actual test those able to do duty and those unable to do so.

The foot camp consists of a company street and two mess shacks. It can accommodate about 300 men. One of the mess shacks is

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given over to orthopaedic work. The kitchen has been transformed into an examining and treatment room. The two small rooms off the kitchen are used by the shoemakers, and all shoe altering is done there. The mess hall is used for giving the barefoot exercises and as a lecture room. Two medical officers and three line officers are on duty at the camp. The duties of the line officers are much the same as those of company officers. They attend to the detachment administration, run the canteen, and are responsible for the military training of the men. The duties of the medical officers, in addition to the purely professional part, are to determine the amount of drill for each case, superintend shoe alterations, and supervise the giving of foot exercises.

The men in the foot camp are considered on special detail. Lists of men to be ordered to the camp and to be discharged are made out twice weekly, and the order is issued by the division adjutant. The men are examined in groups soon after admission to the camp. The examining surgeon takes a short history and makes the physical and foot examinations. This is briefed on a S. & W. card. He orders the required shoe alteration and determines into which drill class the man should be placed. The man is then turned over to a trained enlisted man who takes the foot measurements for shoe size. If the man's shoes fit properly, they are tagged and turned over to the cobbler for the prescribed alteration. If the shoes are ill-fitting, they are exchanged at the quartermaster's and the correct shoes altered. By these means men are examined, placed in their drill class, and given corrected shoes with orthopaedic alterations, within twenty-four hours after entering camp.

In the past, all types of defective feet have been encountered. A valuable experience has been gained which has been put to practical application in examining men for induction. In the future, by rejecting the irremediable conditions, time and trouble will be saved. In treating the men in the orthopaedic camp we make use of the following: Orthopaedic shoe alterations, foot exercises, and graduated drill. Many types of shoe alterations have been tried. We have finally adopted a simple inside wedge for sole and heel for longitudinal arch trouble. Experiments have shown that the wedges should be placed between the layers of sole and heel. When nailed on the outside the life of the alteration averages about three weeks; inserted it is effective as long as the shoe lasts. For anterior arch affections, an anterior heel similarly inserted, and fitted with the man present, is employed. Foot exercises are given to all at

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setting-up drill. The no-drill class take barefoot exercises twice daily for half-hour periods. The other men have one period of a half-hour of barefoot exercise. Our detachment is divided for convenience and management into three classes, no-drill, drill and heavy drill. The no-drill men take foot exercise and do light details. The drill class do infantry drill, graduated to their ability. The heavy-drill men take hikes in addition to other drill work. In most cases men on entering are placed in the no-drill class, and as their foot condition warrants, they enter the drill and finally the heavy-drill detachment. By this means the men are thoroughly worked out. Those able to do full duty are returned to their organization and their commanders informed that the men can do full duty. Those who cannot be made fit are recommended for D. S. O. or S. D. C. as the case requires.

There is another aspect to the treatment of this class of cases beside the purely physical, *i. e.*, the mental. Three types of cases are encountered, those with real defects, the timid, and malingerers. Those with real defects need only the line of treatment suggested above. The timid lack confidence in their feet and imagine all kinds of trouble. In this class a thorough physical examination, assuring them there is no serious trouble, together with increasing exercise up to full duty, restores confidence in themselves and their feet. In a detachment like the foot camp, where men are under close supervision, it can soon be determined who the malingerers are. These men are then assigned to the hard, disagreeable details. The system of granting privileges only to the men doing heavy drill has proved a great incentive to work. It is explained to the others that since their foot condition is such that they cannot do full duty, it is inadvisable for them to put any extra strain on their feet until they are able to stand full drill. The men are treated like soldiers and their interest in military subjects is sustained; with privileges to those who do well, an incentive for work exists. By continuing military training the men go back to their organizations fully able to continue their work, benefited both mentally and physically.

Eight hundred and twenty-two men with foot defects have been detailed to the Orthopaedic Camp in the four and a half months of its existence; 614 men have been returned to their organizations. Of these, 447 have gone back to full duty, 167 have been recommended for domestic service or discharge. These results show that approximately 70 per cent of men with foot trouble can, by proper methods, be made fit for full duty. In the future this percentage

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will be much higher, for no irremediable defects will be accepted.

The organization of an orthopaedic service for the division in the field is of great importance. To carry on this work a division orthopaedic surgeon, company non-commissioned foot officers, and regimental chiropodists have been trained. Cobblers have been instructed in making orthopaedic shoe alterations.

As no orthopaedic surgeon is assigned to the division as such, a surgeon with a knowledge of this subject has been trained to take up this work. His duties in camp have been in connection with the orthopaedic camp and semi-weekly visits to the regimental infirmaries. He will be able to continue this work on the other side. By consultation work, supervising the work of chiropodists and trained enlisted men, teaching new men, and recommending means to keep the men "foot fit" it is believed that much good will be accomplished.

Enlisted men have been trained at the foot camp to act as company non-commissioned foot officers and regimental chiropodists. Three courses, each of three weeks duration, have been held, and each company has been supplied with one, each regimental infirmary with two, trained men. Company non-commissioned foot officers and chiropodists received the same training, with the exception that the chiropodists were given an extra week of practical training in treatment of foot conditions. The course was made interesting and practical. The following is a synopsis of the course as approved by the Operations Section of Division Headquarters:

1. Anatomy and physiology of the foot.
2. Arch trouble; pathological conditions of longitudinal and anterior arches, with causes and treatment.
3. Foot deformities involving the forefoot; bunions; hammer toes, etc.
4. Foot exercises and general management of weak feet.
5. The army shoe: construction, care, repair, orthopaedic modifications.
6. Shoe fitting.
7. Care of feet; care of socks.
8. Asepsis; technique in chiropody.
9. Corns and callouses: nature, cause, prevention, treatment.
10. Ingrown nails; irritations; blisters; excoriations.
11. Trench foot; rarer causes of foot trouble; circulatory, nervous, skin diseases.
12. Brief consideration of sprains.

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13. Demonstration of the use of adhesive plaster; felt; straps, etc.

14. Prevention of foot trouble.

15. General review.

At the termination of the course the men were given an examination, and a letter sent to their commanding officers stating the nature of the men's work. If a man successfully completed the course, he was certified as able to do the following, subject to the direction of his commanding officer:

1. To measure the feet of the enlisted men for shoes and to see that they received those shoes.

2. To instruct men how to take care of their feet.

3. To give the foot strengthening exercises and see that the corrected shoes, ordered by the orthopaedic surgeon, are worn.

4. To treat minor foot conditions, as corns, callouses, irritations, etc., to give first aid foot treatment in the field.

The commanding officer was further instructed to place the man's qualification on his service record.

This divisional orthopaedic organization has worked out very successfully in this camp. The semi-weekly visits to the infirmaries have been welcomed by the surgeons. They have stimulated interest in this line of work. The visits have also been advantageous in allowing supervision of the work of the regimental chiropodists. These chiropodists are doing excellent work. The company non-commissioned foot officers have shown their worth particularly in fitting shoes. Much of this work can be continued in the field, and it is hoped that the efficiency and comfort of the men will be enhanced thereby.

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EMPYEMA[1]

By Captain EUGENE W. ROCKEY
Medical Corps, U. S. Army
(With eighteen illustrations)

THE cases of empyema at Camp Lewis can be divided into two groups. The first is caused by the pneumococcus and runs a clinical course similar to the empyema of civil life. The second, which interests us particularly, is caused by a hemolytic streptococcus. In the earlier cases the hemolytic action of the streptococci was not determined, but since all the cases in which this test was applied were found to be hemolytic, it seems a fair supposition that in the undetermined cases the streptococci were also hemolytic.

In the pneumococcus empyemas, rib resection with simple drainage gave good results. The empyemas caused by the hemolytic streptococci presented a different problem, and it is with this group that our report deals.

The course of the empyema has been variable. At times the severity of the infection presented both clinically and at autopsy seemed overwhelming. This was especially true in the ten cases which followed measles (mortality 40 per cent). The pathology found at post-mortem examination was that of empyema, with purulent pericarditis, walled-off pockets of pus between the lobes and, substernal pockets. This tendency toward pocketing has been noted in many of the cases (six of them requiring two incisions to reach separated pockets of pus).

The diagnosis of empyema has been difficult in these cases. We were accustomed to thinking of pus as a thick, creamy fluid. At first we were loth to consider as pus, a fluid which was only cloudy and yet contained pus cells and streptococci. We soon realized, however, that this was pus, and all cases with this type fluid have been classed as empyema. The X-ray was an important aid in diagnosing fluid. The use of the aspirating needle was found advisable, particularly as a diagnostic aid.

The average time from the onset of the pulmonary symptoms to the time of operation was fourteen days; many of the cases, however, were much shorter, the shortest being four days. One reason

[1] From Surgical Service, Base Hospital, Camp Lewis, Washington.

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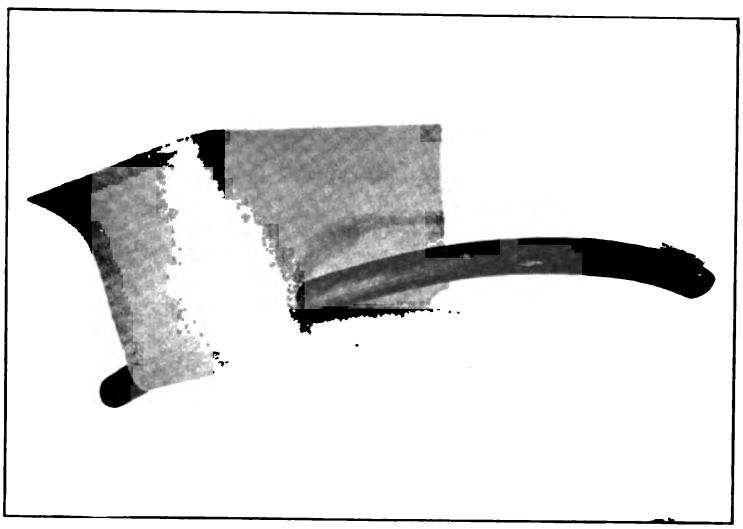

FIG. 1.— DRAINAGE TUBE WITH DRAIN FLANGE AND PERFORATIONS.

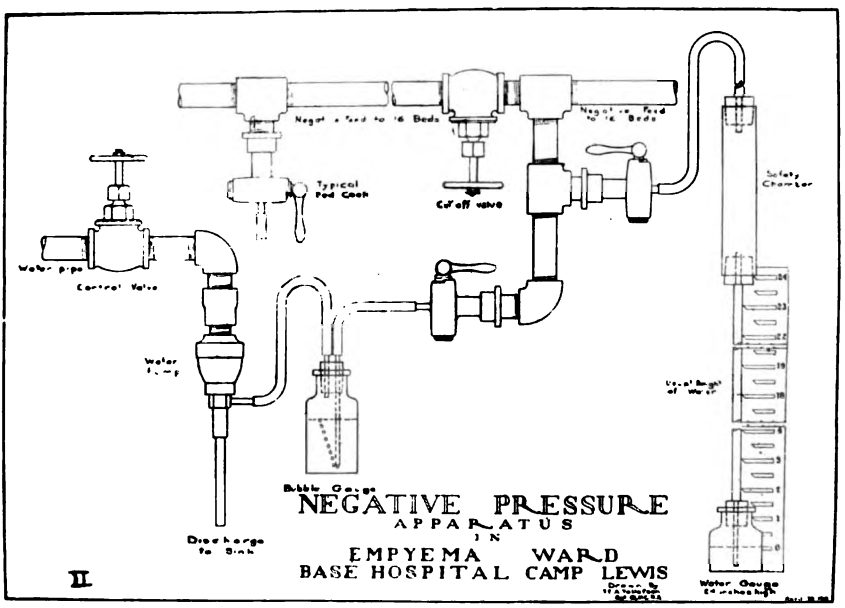

FIG. 2.—DIAGRAM OF NEGATIVE PRESSURE APPARATUS.

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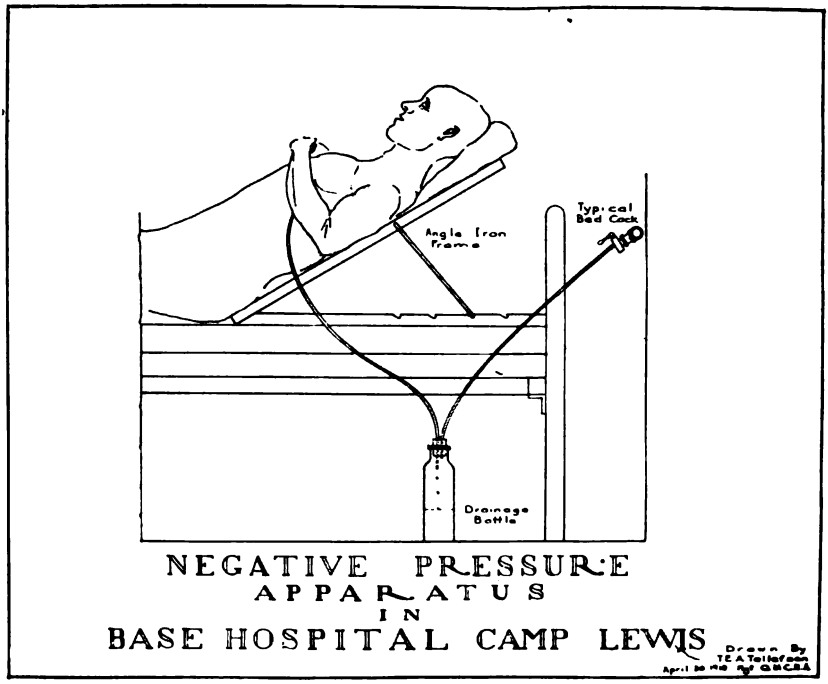

FIG. 3.—DIAGRAM OF ATTACHMENT OF NEGATIVE PRESSURE APPARATUS TO PATIENT.

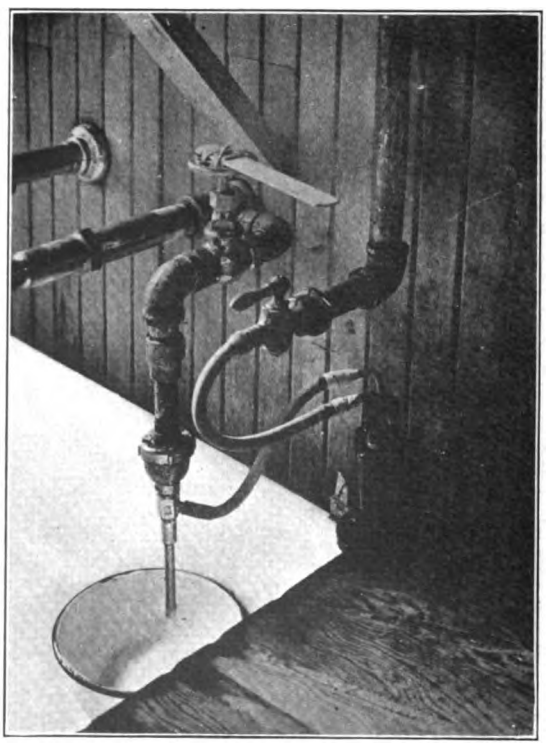

FIG. 4.—WATER PUMP WHICH CREATES NEGATIVE PRESSURE. BUBBLE GAUGE SHOWN AT RIGHT.

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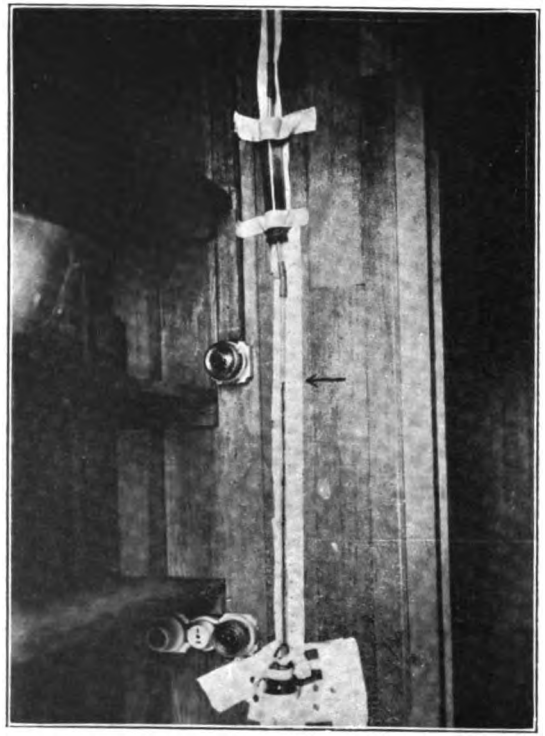

FIG. 5.—WATER GAUGE WITH SAFETY CHAMBER ABOVE.

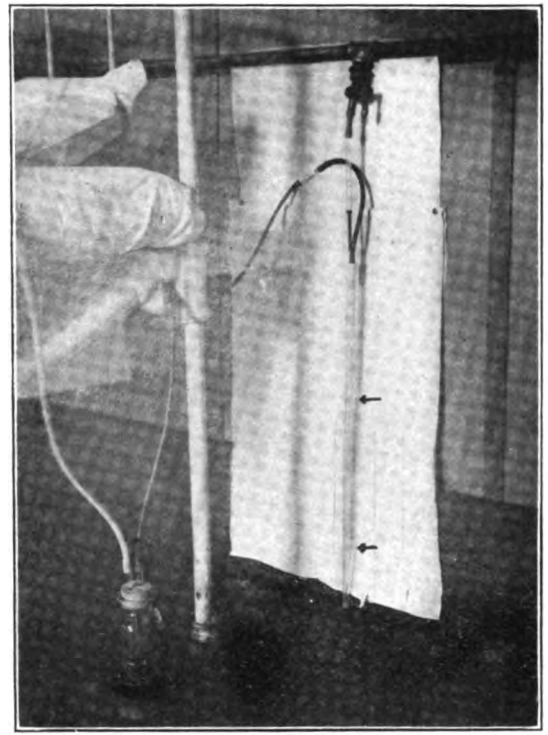

FIG. 6.—PRESSURE REDUCER. ARROWS SHOW DIFFERENCES OF WATER LEVEL.

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FIG. 7.—CASE WITH TWO ENCAPSULATED CAVITIES, EACH DRAINED BY NEGATIVE PRESSURE.

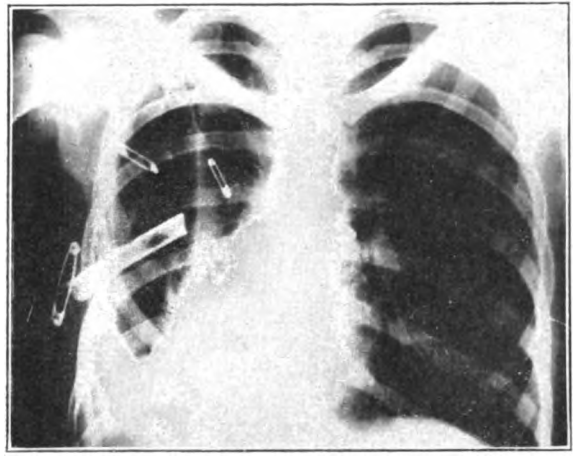

FIG. 8.—LARGE PNEUMOTHORAX CAVITY IN CASE WITH RIB RESECTION WITHOUT CONSTANT NEGATIVE PRESSURE.

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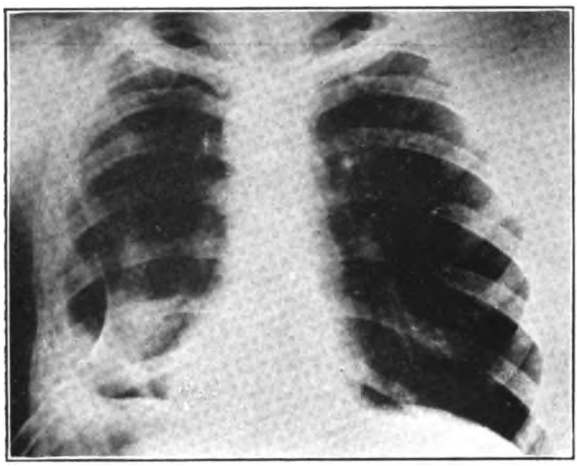

FIG. 9.—LARGE PNEUMOTHORAX CAVITY IN CASE WITH RIB RESECTION WITHOUT CONSTANT NEGATIVE PRESSURE.

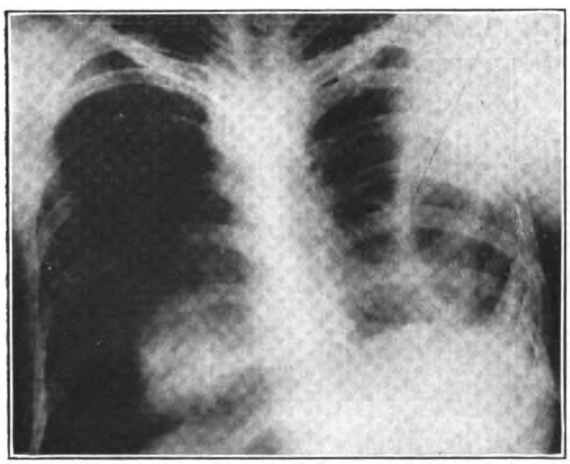

FIG. 10.—LARGE PNEUMOTHORAX CAVITY IN CASE WITH RIB RESECTION WITHOUT CONSTANT NEGATIVE PRESSURE.

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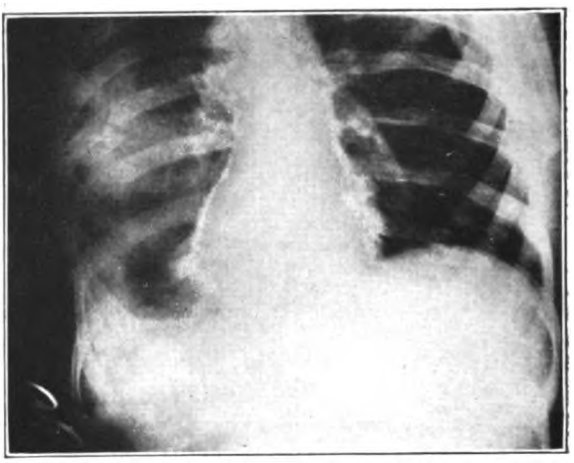

FIG. 11.--SHOWING FULL EXPANSION OF LUNG AND WELL-DRAINED PLEURA. THORACOTOMY WITH CONSTANT NEGATIVE PRESSURE.

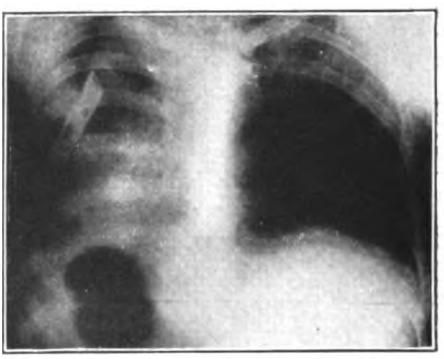

FIG. 12.—SHOWING FULL EXPANSION OF LUNG AND WELL-DRAINED PLEURA. THORACOTOMY WITH CONSTANT NEGATIVE PRESSURE.

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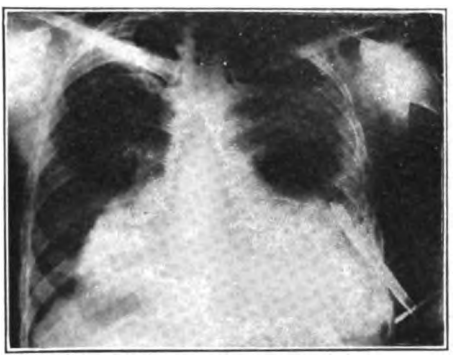

FIG. 13.—RIB RESECTION AND SIMPLE DRAINAGE AT POINT SHOWN BY DRAINAGE TUBE. ENCAPSULATED EMPYEMA ABOVE. X-RAY TAKEN 3 WEEKS AFTER OPERATION.

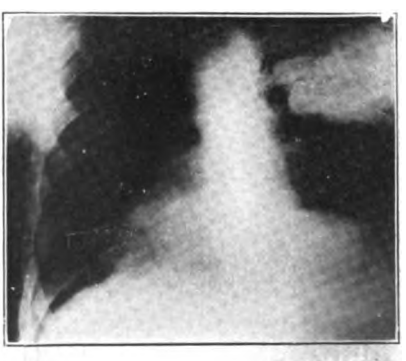

FIG. 14.—CASE WITH TWO SEPARATE ENCAPSULATED CAVITIES. BOTH DRAINED WITH THORACOTOMY AND CONSTANT NEGATIVE PRESSURE.

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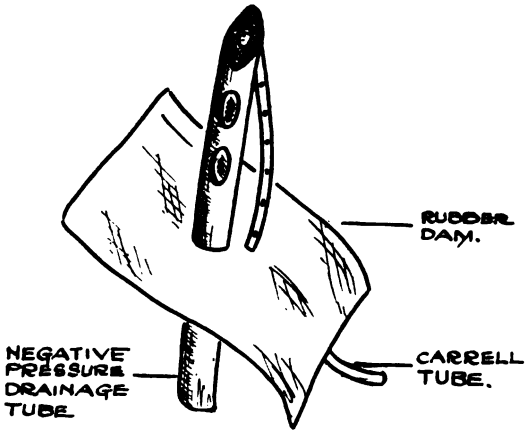

FIG. 15.

FIG. 16.—ILLUSTRATING CARREL-DAKIN AND NEGATIVE PRESSURE TREATMENT COMBINED.

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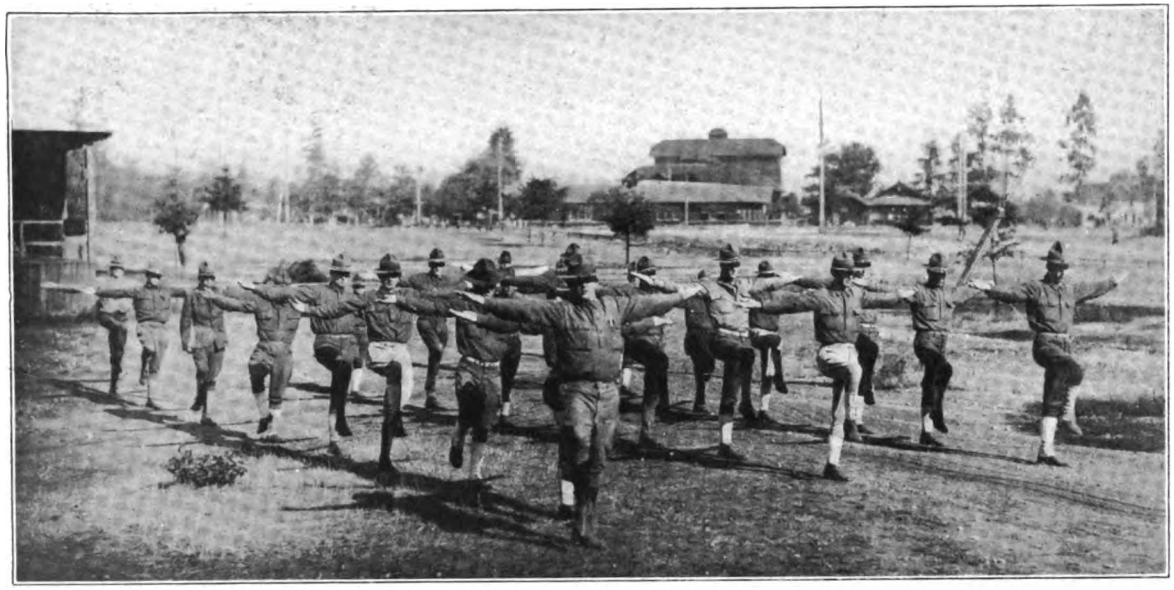

FIG. 17.—EMPYEMA COMPANY AT SETTING-UP EXERCISES.

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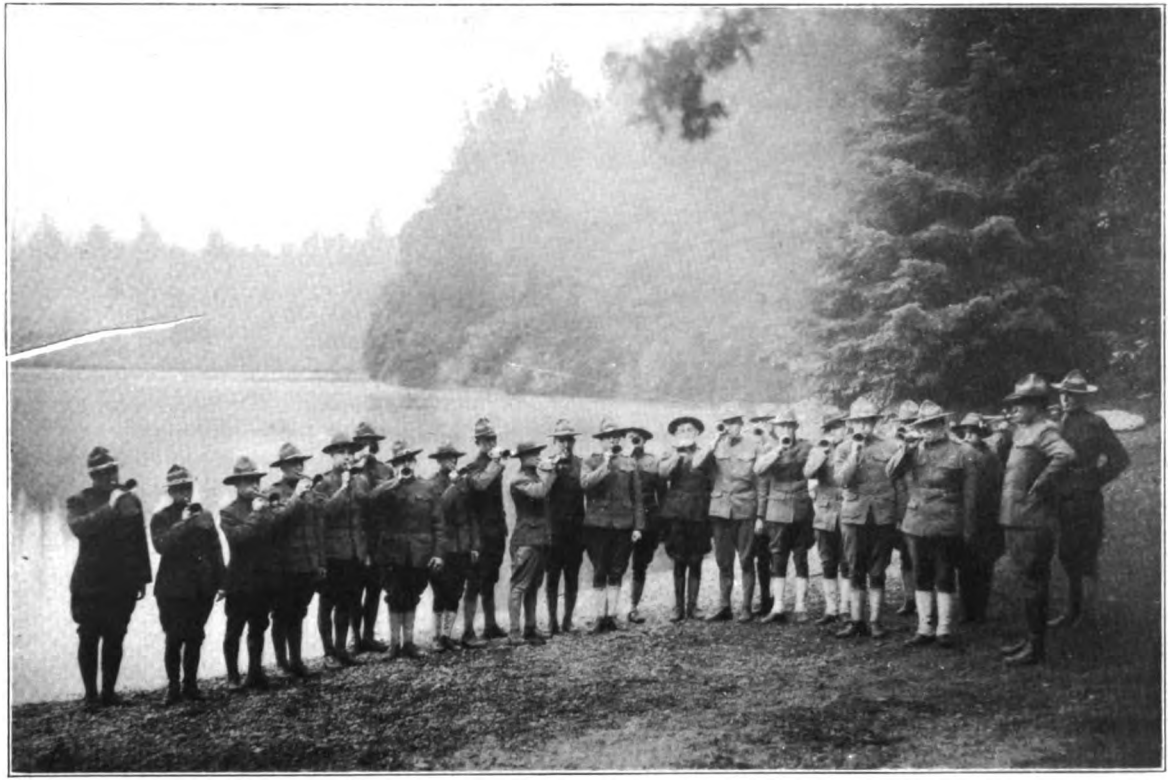

FIG. 18.—EMPYEMA COMPANY BLOWING BUGLES TO DEVELOP IMPAIRED LUNGS. SCENE IN FOREST ON SHORE OF AMERICAN LAKE.

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for the long average of fourteen days was that in several of the cases, particularly the earlier ones, much time was lost in waiting for the pleural fluid to become thick pus. At first we were in grave doubt as to the most favorable time for operation. In some of these cases the pneumonic process was of minor consequence, the empyema being noted almost at the onset of the pulmonary symptoms. Very rapid accumulation of fluid was noted in many cases.

The fluid in the great majority of cases was thin and cloudy. On being allowed to stand, it precipitated a layer of pus, leaving a clear serous fluid above. Microscopic examination showed this sediment to be pus cells and large numbers of streptococci. Culture showed a hemolytic streptococcus. None of the cases with this type of fluid cleared up without operation. There were two pneumonia cases with the physical signs of a small amount of fluid at the base. Aspiration brought clear fluid, microscopically a few pus cells, no organisms in the smear, but the culture showed streptococci. These cases clinically were not empyemas and made uneventful recoveries. The majority of empyemas were operated on when the fluid, as removed with a syringe for diagnosis, showed a sediment of from one-fourth to one-half pus, with clear fluid above.

It should be noted that frequently a diagnostic needle withdrew only cloudy fluid, which would settle out to one-fourth or even less pus, and yet, when operation was done immediately afterward, comparatively thick pus was obtained. In some cases it was very thick pus. This was due to sedimentation having taken place in the patient's chest. This is an important point and should be borne in mind, as otherwise the diagnostic needle may be very misleading as to the character of the pus present in the chest.

Many methods and procedures have been tried and abandoned. Waiting for this thin pus to thicken, in the meanwhile aspirating, seemed not only to be of no advantage but to be followed by metastatic abscesses and facial erysipelas (two cases) more often than when immediate operation was performed. Rib resection with simple tube drainage, which proved so satisfactory with the pneumococcus empyemas, did not prove satisfactory. The mortality was high (25 per cent), and there are in the hospital several cases with marked collapse of the lung, and large pneumothorax cavities. These may later require surgical treatment such as decortication or chest collapsing operations. An effort is now being made to reduce the size of these cavities by constant negative pressure. Simple

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thoracotomy with continuous negative pressure was finally adopted.

The following is in the nature of a preliminary report. Too short a time has elapsed to draw final conclusions from seventeen operated by this method. The drainage tube is prepared before operation (see Fig. 1) as follows: a ⅝-inch rather stiff walled rubber tube 8 inches long has cemented to it, 3 inches from one end, a rubber-dam flange 5 inches square. Large perforations are made in the long end of the tube, beginning 2 inches from the flange, and continuing spirally away from the flange, thus insuring maximum openings with slightest danger of collapse of the tube. The operations are performed in the following manner. Under ¼ per cent novocaine, local anesthetic, a diagnostic needle attached to a 30-c.c. glass syringe is introduced through the chest wall at the site selected for drainage. This is usually in the post-axillary line about the sixth interspace or posteriorly below and inside the angle of the scapula. If purulent fluid be obtained, the syringe is disconnected, leaving the needle sticking through the chest wall into the pus cavity. Under the local anesthetic previously injected, a 1½-inch incision is made alongside of the needle exposing the interspace at the point of entrance of the needle. With a sharp scalpel a quarter-inch incision is made through the intercostal fascia just at the upper border of the lower exposed rib, great care being taken to avoid a deep incision with possible wounding of the intercostal vessels which lie at the lower border of the rib next above. The diagnostic needle is grasped in a hemostat to insure against its loss.

The patient is now given nitrous-oxide anesthesia and, as soon as he is "under," a strong curved hemostat is boldly pushed through the interspace alongside the diagnostic needle. Unless the maneuver is done in this way the thickened pleura may be pushed in by the end of the hemostat without opening the pus cavity. The needle is now withdrawn and the curved hemostat is opened and forcibly withdrawn while open, thus making a sufficient orifice into the empyema cavity. The previously prepared perforated tube is next introduced through this opening to such a level as to bring the rubber flange to the outside of the chest wall. Care should be taken to direct the tube so that it lies close to the chest wall within the cavity. The gas anesthesia is now discontinued (usual time of gas anesthesia being two minutes). This use of gas does not seem irritating and adds greatly to the comfort of the patient, as the procedure proved rather painful under local anesthesia. As soon as the pus flows freely through the tube the outer end of the tube is closed with a hemostat before air has entered the chest cavity.

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The skin and muscles are now approximated with two interrupted silkworm gut sutures, one on each side of the tube. After these sutures are tied approximating the skin, they are passed about the tube holding it in place. The rubber-dam flange is now laid smoothly on the chest wall, and the dressing, consisting of a single gauze and cotton pad with a slit cut to its center, is placed on top of the flange with the tube projecting from the center of the pad. This is firmly fastened to the chest with two broad strips of adhesive plaster.

The patient is now turned toward the affected side, the end of the tube being held over a bucket. He is instructed to blow hard after taking a deep breath. During inspiration the hemostat is kept closed on the tube; during the forced expiration the hemostat is opened. In this way the hemostat acts as a valve, and the empyema cavity is soon emptied of its pus without any air having entered. When the cavity is sufficiently emptied the hemostat is clamped on the tube, and the patient taken to the ward and put to bed.

The constant negative pressure is then applied. The operative technic is given in detail because it is but slightly traumatic, rapid, painless, certain and efficient. An easily regulated measurable constant negative pressure was desired. It was obtained in the following way (Fig. 2). A water pump (Fig. 4) was attached to the cold water pipe over the sink in the utility room. This pump exhausted the air from an ordinary ¾-inch gas pipe, which was extended the full length of both sides of the ward and the small isolation room. In this pipe, at each bed, was placed an ordinary gas stopcock. There were thirty-two such bedcocks, sixteen on each side of the ward. Between the gas pipe and the water pump was placed a bubble gauge to show the amount of leakage in the entire system. A water gauge (Fig. 5) was attached to the main line above the bubble gauge. This consisted of a glass tube immersed in an open jar of colored water. The negative pressure in the entire system is thus registered by the height of this column of water. (Experiments showed the pressure to be uniform over the entire ward.) Above this water gauge was placed a safety chamber consisting of a much larger glass tube. The amount of water in the jar below the water gauge was such that, if the negative pressure became greater than 24 inches of water, the entire column of water would rise through the narrow gauge tube and, becoming much shorter in the expanded safety chamber, would allow air to pass

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through it, thus lowering the pressure until the water would pass down the gauge tube. This safety chamber makes it impossible for any careless attendant to increase the pressure above 24 inches of water. On each side of the main division in the pipe was placed a cutoff valve (Fig. 2). If a leak occurred in any part of the system, closing one of these valves would show on which side of the ward the leak was.

From the bedcock a rubber tube was carried to the shorter of two glass tubes, which entered the drainage bottle through a perforated rubber cork (Figs. 3 and 7). The longer of these glass tubes was connected by a rubber tube one-half inch in diameter with the flange tube placed in the chest at operation. Thus a constant negative pressure was maintained in this drainage bottle and in the pleural cavity. A bichloride of mercury tablet dissolved in one ounce of water was placed in each drainage bottle every time it was emptied and cleaned.

It was found that after the first twenty-four hours post-operative that a negative pressure of 18 inches of water, supplementing the variable gravity drainage from the level of the bed to the floor, was sufficient to keep the lung fully expanded and the cavity emptied of pus. It was also found that, if the pressure increased above 24 inches of water, blood began to appear in the drainage, and the patient complained of pain.

During the first twelve or twenty-four hours after operation the patients were unable to tolerate a negative pressure greater than 8 inches of water in addition to the gravity drainage mentioned before. Therefore it was necessary to reduce the pressure for the new cases. This was done by means of a very simple apparatus, introduced between the bedcock and the drainage bottle. The pressure reducer (Fig. 6) was made by passing two small glass tubes through a perforated cork into a large glass tube. One of these small glass tubes ran almost to the closed bottom of the large tube. The other small tube just penetrated the cork at the top. The short tube connects with the bedcock, the long tube with the drainage bottle. Enough water (experimentation necessary with each reducer) is placed in the larger tube so that when the negative pressure is turned on there will be a 10-inch difference in the water levels in the small and large tubes. This reduces the system pressure of 18 inches to the 8 inches desired in the recently operated case.

The amount of drainage in the first few hours varies accord-

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ing to the thoroughness with which the cavity was emptied on the operating table. There is usually from 500 c.c. to 1,000 c.c. during the first twelve hours. During the next twenty-four hours the drainage lessens noticeably in amount to from 100 c.c. to 200 c.c. During this period it frequently becomes thinner in character. After the third day the average amount of drainage gradually lessens in amount and becomes thicker in character.

It has been noted that the cases in which long drainage tubes, projecting about 2 inches into the chest cavity but lying alongside the chest wall, were used, that the post-operative course was smoother and that there was less tendency for the drainage to block up. We do not believe that this extra length tube inside the pleural cavity causes enough pleural irritation to militate against its use.

The X-ray has proved to be of the greatest importance, not only as a diagnostic aid in doubtful cases, but also in determining the efficiency of treatment, as is shown by full expansion of the lung and of the complete emptying of the pus cavities. In several cases of small encapsulated empyema, the definite diagnosis and localization was made only with the aid of the X-ray. Routine radiographic examination of the chest in all suspected empyema cases has been carried out for several months, and routine weekly X-ray examinations of all post-operative cases have more than repaid the cost and effort expended. In addition to these routine examinations every post-operative case with fever was radiographed, and thus partially drained accumulations were discovered and located before they had done more than a minimum of harm. Fig. 7 shows collapse of the lung and accompanying pneumothorax in a case of rib resection without negative pressure. Fig. 8 shows full expansion of the lung and efficient drainage in a case of thoracotomy with constant negative pressure. Figs. 9 and 10 show encapsulated empyema. In three cases two separate encapsulated empyemas occurred in the same pleural cavity. These were localized by the X-ray and drained separately by thoracotomy and constant negative pressure in each cavity (Figs. 7 and 14) with good results to date.

The post-operative course of the cases in which constant negative pressure was used has been much better than with other methods. This is clearly shown in the following ways: The appearance of the patient is almost uniformly good. The temperature chart in the majority of cases shows a drop to normal within two or three days and rarely a rise of temperature to 99.6 afterward, this

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in contradistinction to the frequently seen persistent septic temperature of the resected cases not on constant negative pressure. In several of the cases, however, the tubes were removed too soon (in three weeks), and these cases relapsed and had fever until the tubes were reinserted and negative pressure reapplied, the X-ray pictures of the chest showing full expansion of the lungs and well-drained cavities. There is no collapse of the chest on the affected side with its attendant scoliosis and stooped shoulders.

The average time between operation and the first dressing has been nine days, and the average interval between subsequent dressings three days. This means a marked economy of both material and nurse's time.

MORTALITY STATISTICS

	No. of cases	*Died*	*Per cent mortality*
Cases operated for empyema	48	5	10.41
Cases empyema diagnosed antemortem, but not operated for empyema	2	2	100
Total cases empyema diagnosed antemortem	50	7	14
Cases empyema diagnosed only at postmortem	8	8	100
Total cases empyema, all groups	58	15	25.86
Operated cases empyema due to pneumococcus	11	0	0
Operated cases empyema following measles	10	4	40
Operated cases pneumococcus empyema, rib resection	10	0	0
Operated cases streptococcus empyema, rib resection only	20	5	25
Operated cases streptococcus empyema, thoracotomy with constant negative pressure	17	0	0

In the mortality statistics above of the two cases diagnosed empyema antemortem but not operated on, one was an early empyema which was diagnosed and tapped the first time twelve hours before death; at this time there was found advanced general peritonitis which was drained six hours before death. The other case of this group was *in extremis* when the diagnosis of empyema following measles was made and it was deemed wiser only to aspirate. He died within twenty-four hours. In the group of eight cases diagnosed only at post-mortem, the following facts are noteworthy: 2 followed measles, 1 followed measles and scarlet fever, 2 followed scarlet fever and diphtheria, 1 followed diphtheria, 1 followed chronic nephritis. In several of these cases the empyema was evidently only of minor importance, being either a terminal infection or a small part of a general sepsis.

Foci of infection other than in the lungs and pleura have been present at the time of operation in several of the cases treated by

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constant negative pressure; two multiple arthritis; one abscesses of buttocks, of leg and epididymis, cystitis and pleurisy with effusion on the opposite side; one abscess of back, of deltoid muscle and of buttock; two facial erysipelas. In all of these cases convalescence has been uneventful.

Several patients with hemolytic streptococcus empyema treated by the negative pressure, seemed clinically about as sick as in some of the fatal cases treated by rib resection with simple drainage.

It is possible that the virulence of the organism causing this epidemic had become lessened when this method of treatment was adopted. None of the cases have been discharged from the hospital.[1]

Conclusions.—Pneumococcus empyema was treated successfully by rib resection and simple drainage.

From the progress of the yet incomplete cases (final results will be reported later), we feel that the most efficient method of treating streptococcus empyema at Camp Lewis has been by thoracotomy, with constant negative pressure. This is shown by: (*a*) Absence of mortality; (*b*) smooth post-operative convalescence, except in cases of too early removal of drainage tubes; (*c*) absence of pneumothorax, as proved by X-ray; (*d*) economy of materials and labor.

[1] Since this was written, the author of the paper has gone over-seas. Fifteen additional cases have been operated and all have recovered or are well on the way to recovery. Our tendency has been to return to rib resection under local anesthesia. We have devised a double tube for the simultaneous treatment by the Carrel-Dakin method, and by negative pressure. Figs. 15 and 16. This has been found useful in cleaning up a few old cases and of undoubted value in shortening the period of morbidity in recent cases. Twenty-six cured cases have either returned to duty or are out on furlough pending return to duty. One has been discharged on S.C.D. We have carried out a plan of development during convalescence that should fit them all for full duty. Figs. 17 and 18.—*Note by the Chief of The Surgical Service.*

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THE COMMUNICABLE DISEASES IN THE NATIONAL GUARD AND NATIONAL ARMY OF THE UNITED STATES DURING THE SIX MONTHS FROM SEPTEMBER 29, 1917, TO MARCH 29, 1918

By Colonel VICTOR C. VAUGHAN, M. C., and Captain GEORGE T. PALMER, S. C., U. S. Army

(*Continued from September issue*)

TYPHOID AND PARATYPHOID

Typhoid fever and its associated disease, paratyphoid, have been of slight consequence in the American Army during the past winter. But three camps showed it to any extent, and even here the incidence was very low. Camps Dix, Bowie, and Sheridan had annual morbidity rates per 1,000 of 2.1, 1.4 and 0.9, respectively. These figures are relatively high as compared with the following rates for people at all ages: Kansas, 1.3; Virginia, 1.1; West Virginia, 0.73; Massachusetts, 0.31; Michigan, 0.29. As over against this, however, there were twelve camps that *did not have a single case* of typhoid or paratyphoid. Included in this list are Wadsworth, Wheeler, Cody, Doniphan, Shelby, Beauregard, Kearney, Jackson, Sherman, Custer, Grant, and Pike. Comparative death rates for the Army and people of all ages in civilian life during the six winter months of the past year are given in the following table:

Table XXIV.—*Typhoid and Paratyphoid in Army and Civil Life*

(Annual death rate per 100,000)

Place	*Rate*
All troops in United States	1.3
National Army Camps (16)	2.3
National Guard Camps (13)	0.6
New York City	3.2
Massachusetts	4.1
Vermont	4.4
St. Louis	5.2
Connecticut	6.4
Colorado	10
Michigan	11
Virginia	18
Maryland	18
Kansas	22
Kentucky	28
Delaware[1]	55

[1] It is of passing interest that the National Army camp with the highest typhoid morbidity rate (Dix) is a mobilization point for Delaware troops.

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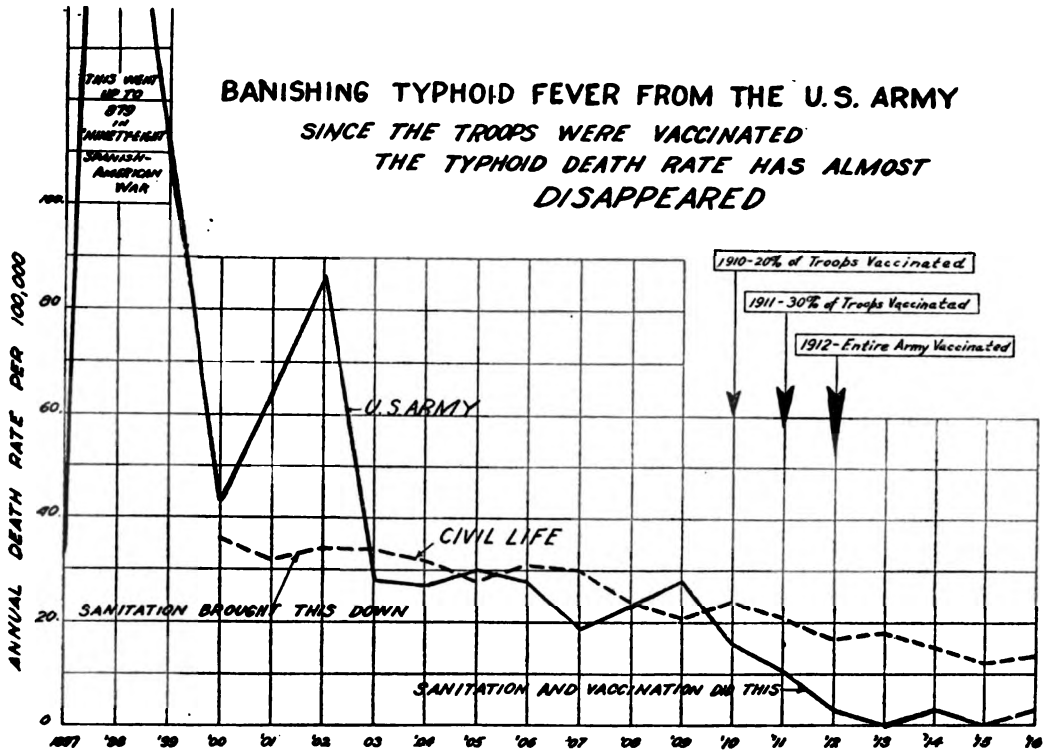
BANISHING TYPHOID FEVER FROM THE U.S. ARMY
SINCE THE TROOPS WERE VACCINATED
THE TYPHOID DEATH RATE HAS ALMOST
DISAPPEARED
THIS WENT UP TO 979 IN NINETY-EIGHT
SPANISH-AMERICAN WAR
ANNUAL DEATH RATE PER 100,000
100
80
60
40
20
0
1910-20% of Troops Vaccinated
1911-30% of Troops Vaccinated
1912-Entire Army Vaccinated
U.S. ARMY
CIVIL LIFE
SANITATION BROUGHT THIS DOWN
SANITATION AND VACCINATION DO THIS
1897 '98 '99 '00 '01 '02 03 '04 '05 '06 '07 '08 '09 '10 '11 '12 '13 '14 '15 '16

CHART XII

NOTE:
Figures for Civil Life represent U.S. Registration Area.

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This result would be even more striking if the civilian rates were computed merely for the age period 20 to 29 years, in which age group typhoid is most prevalent.

It would be difficult to put forward testimony of a more striking nature as to the efficacy of the preventive measures now being utilized in the Army against typhoid fever. To be sure, the past season has not been the typhoid part of the year, and it is possible that the value of the typhoid prophylaxis will be more severely tested during the warmer weather and the fly season.

The American soldier today has found the army camp a safer place in which to dwell, so far as typhoid fever is concerned, than the most favorably situated civilian community. Chart XII has been inserted to show the decline in the typhoid death rate in the American Army since 1897.

DIPHTHERIA

Deaths from diphtheria have occurred in only seven out of twenty-nine camps, the rates for which are as follows (annual death rate per 100,000): Pike, 30; Funston, 22; Dodge, 18; Cody, 17; Custer, 10; Doniphan, 8; Logan, 7. The death rate for diphtheria and croup in the United States Registration Area in 1915 for all ages was 15.7.

TUBERCULOSIS

As illustrated in an earlier table, the tuberculosis death rate in the Army is much lower than in civil life, owing to the elimination of the tuberculous by physical examination. Many recruits with undetected tuberculosis passed into the Army, however, and the deaths of some of these occurred within the past six months.

The tuberculosis death rate for the Guard and the National camps is given in Table XXV.

TABLE XXV.—*Tuberculosis in Army Camps*

(Annual death rate per 100,000)

Camp	*Army group*	*Rate*
Wheeler	N. G.	80
Pike	N. A.	44
Beauregard	N. G.	43
Wadsworth	N. G.	39
Sherman	N. A.	38
Lee	N. A.	32
Funston	N. A.	30
Kearney	N. A.	29
Upton	N. A.	27
Grant	N. A.	23

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Jackson	N. A.	22
Gordon	N. A.	21
Custer	N. A.	20
Dix	N. A.	19
Sevier	N. G.	15
Dodge	N. A.	9
Sheridan	N. G.	9
McClellan	N. G.	8
Taylor	N. A.	8
Shelby	N. G.	8
Travis	N. A.	7
Hancock	N. G.	6
Lewis	N. A.	6
Logan	N. G.	0
Cody	N. G.	0
Doniphan	N. G.	0
Bowie	N. G.	0
Devens	N. A.	0
Meade	N. A.	0

EPIDEMIC BRONCHITIS

This disease has prevailed at all camps, but the only detailed report we have had is from the epidemiologist at Fort Oglethorpe. In view of the fact that this and allied ailments, which are looked upon as of minor significance, are so widespread and so common to all camps and are so largely responsible for hospital and quarters cases of a few days' duration each, it is felt that a description of the situation as reported from Oglethorpe is of especial interest. Illnesses of this character have assumed added importance since they have come to be regarded as predisposing factors to such diseases as pneumonia and meningitis.

Bronchitis has been well-nigh universal in the Oglethorpe group of camps. Within ten days after their arrival, newcomers have generally been attacked, the symptoms often being pronounced from the start. Sneezing and coughing are early signs. In the barracks, mess halls, lecture rooms and places of amusement, during November, December and January, there was seldom a moment when coughing was not noticeable and continuous. It is estimated that 80 per cent of all the troops were affected. The epidemic abated in February with the advent of warm weather. Laboratory findings do not agree that any single organism has been the cause. Streptococci, staphylococci, influenza bacilli and other organisms, found in the noses and throats of healthy people and sometimes associated with disease, have been isolated, but not under circumstances which have led to any of these germs being demonstrated as the microbic cause of the bronchitis. The infectious matter has passed from

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person to person, probably in three ways: First, men have talked with one another at close range, permitting mouth germs to be projected directly into one another's face. In the second place, there has been a general impregnation of the atmosphere in confined spaces. In the third place, articles handled by the infected have been transmitted to others. In these ways the amount of infectious matter which has passed from person to person must have been large, and, meeting a lowered resistance, the infection has rapidly spread.

Predisposing and contributing causes existed to some extent. The weather was unfavorable. Changes in the temperature were frequent and marked. The ground was cold, the air damp, and the nights cold. Often men did not have dry shoes for weeks at a time. Some spent the entire winter in khaki. The men themselves were ignorant of simple personal precautions which might greatly have lessened their chances of infection. All of the severe cases have gone to the hospital. The universal prevalence is significant, both on its own account and because of the light which it throws upon the spread of other respiratory diseases in these camps. Although most persons regard bronchitis with comparative indifference, it is a disease of much significance. It is the common saying among the troops that the "bronchial cold" which attacks them soon after their arrival remains with them so long as they stay in camp. Its characteristic hard, explosive cough remains after other symptoms have disappeared. For the time it often unfits a man for duty, and there are few sufferers whose efficiency has not been impaired by it. The bronchial pneumonia of these camps has been frequent a sequel to bronchitis. Whether bronchitis renders a man especially susceptible to other acute respiratory diseases is a question of much interest. Like pneumonia, one attack does not protect against others, but, on the contrary, seems to predispose its victim to subsequent attacks. It is probable that bronchitis reduces resistance to measles, scarlet fever, pneumonia and other such diseases. The part which bronchitis may play in the spread of other respiratory infections gives reason for regarding it as a camp disease of the utmost importance. A carrier of meningitis may be relatively harmless so long as he is in good health, for then the germs which he harbors are fairly well locked up in his nose and in his throat, but when he experiences an attack of bronchitis he sneezes and coughs, and at each paroxysm, germs are shot into the air. Therefore it is

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reasonable to suppose that measles, scarlet fever and other respiratory diseases have been spread by bronchitic soldiers. It may be asked if the exchange of bacteria from the nasal pharynx be so general, why is it that more sickness has not occurred. The answer probably is that most robust soldiers possess a fair degree of immunity acquired either by one attack, as in the case of measles, or by frequent exposure without suffering from the disease.

The bronchitis which has prevailed in these camps may be designated as an acute infectious inflammation affecting in rapid succession downward the nasopharynx, the larynx, trachea, and the first and second divisions of the bronchial mucosa. The symptoms are coryza, chilly sensations, hoarseness and soreness of throat, weakness, muscular soreness and slight fever (100° to 101°). In severe cases the temperature may rise to 103°, with the correspondingly rapid pulse accompanied by substernal soreness and tightness of the chest. At first the cough is dry and unproductive. It frequently occurs in paroxysms, causing muscular pain and soreness along the costal margin at the attachment of the diaphragm. On the third or fourth day, as a rule, the cough loosens and expectoration appears. At first this is scanty and mucous; later it is abundant and muco-purulent. Only negative results are obtained on palpation and percussion. On auscultation sibilant râles may be noted, except when resolution begins, when fine and coarse mucous râles are to be heard. The breath sounds are harsh. Bronchitis may be associated with other diseases, such as measles, mumps or scarlet fever. When not complicated, recovery occurs at best within a week, although a chronic form may supervene and continue for months.

Although chronic bronchitis as seen in the quarantine camps is believed to be a definite entity, it is not always so diagnosed. Cough elevation of temperature and muscular soreness accompany acute nasopharyngitis and tracheolaryngitis as frequently as bronchitis. A positive diagnosis of bronchitis is impossible unless harshness of breath sounds, sibilant and sonorous râles are audible, or, in a stage of resolution, fine and coarse mucous râles are heard. Many cases are diagnosed as bronchitis from the symptoms alone.

Pneumonia is not frequently preceded by acute bronchitis, and acute bronchitis rarely terminates in pneumonia except when it accompanies measles. In measles there may be an extension to the terminal bronchi and the intercommunicating air cells, under which circumstances broncho-pneumonia develops.

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INFLUENZA

Influenza, like bronchitis, has prevailed widely in camp, and we are indebted again to the epidemiologist at Oglethorpe for a description of this disease, which undoubtedly accords with the situation at many camps.

A disease strongly resembling influenza became prevalent in the Oglethorpe camps about March 18, 1918. It soon assumed endemic proportions. Within two weeks every organization in Camp Forrest and the Reserve Officers' Training Camp was affected. It seems to have visited only a part of Camp Greenleaf. The war prison barracks were not invaded. After about three weeks the epidemic subsided rapidly. The number of cases sent to hospital or to quarters was 1,468 in a total strength of 28,586. Owing to the fact that many cases were not severe, the total number of officers and men attended cannot be given; an estimate based on replies to a circular letter of inquiry to the several organizations indicates that not less than 2,900 cases have occurred in Chickamauga Park.

The attention of the Camp Surgeon's Office was called to the existence of this disease on March 18, at which time the writer saw a number of men appear at sick call in the 51st Infantry, suffering from the disease, which the regimental surgeons were unable to diagnose. The symptoms were as follows: Headache, pain in the bones and muscles, especially the muscles of the back, marked prostration, fever (sometimes as high as 104°). Sometimes there are conjunctivitis, coryza, a rash and possibly nausea, recovery taking place in a few days.

In most cases a definite diagnosis was not made at the regimental sick call, but at the receiving ward, and when a name was given, it was usually called influenza.

On April 3 it was recommended that stock be taken to ascertain, from the several organizations under the supervision of the camp surgeon, from other camps in the Oglethorpe region, the essential facts concerning the nature and epidemiological progress of the disease. A circular letter of inquiry along these lines was sent out on April 4 to all organizations. Replies to this questionnaire indicated that the disease was first noticed in epidemic form on March 18 in the 51st Infantry. In some organizations all cases were sent to hospital; in others their cases were treated in quarters or in the regimental infirmary. This does not mean that the disease was more severe in some organizations than in others. Difference in the

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disposition of the sick depended not so much upon the severity of the case as upon the local facilities for dealing with them. Records show that there were twice as many patients dealt with in quarters as in hospitals, and there were probably twice as many cases existing as were carried on sick report.

The replies were unanimous in stating that the disease was not restricted to recruits nor to men who had already experienced or failed to experience an attack of measles, German measles, or scarlet fever. One attack did not protect against another.

In all the organizations the epidemic was first located in companies before it became general. In many instances a large proportion of the men was affected. According to the registrar of the base hospital, fully one-half of the total number of patients in the hospital had the disease. The rate at which the epidemic progressed made it impossible to trace its path, if indeed it followed any.

The incubation period was short, usually not over one or two days. Instances were found in which men isolated in quarantine were attacked apparently through contact with those who brought them food or approached them for other reasons. At the post hospital a number of surgical cases in tents were infected, apparently by an orderly. In Company B of the 15th Machine Gun Battalion, which was in quarantine on account of scarlet fever, nearly every one present was attacked. In Company A, 52d Infantry, a company which was quarantined, the men appeared to be protected by reason of their isolation.

Some organizations suffered more than others for no apparent reason. The 52d Infantry had the most and the 54th Infantry the fewest cases. In the 52d Infantry and the 15th Machine Gun Battalion, one in every seven of the officers and men was on sick report. In one ambulance company the proportion was one to six, while in others it ran as low as one to twenty-five.

The possibility that the disease which has just become epidemic has long existed in these camps in sporadic form, but has not hitherto attracted notice because of its infrequency, has received careful consideration. At first there seemed much to recommend this theory. Clinicians on the hospital staff claimed to have seen the disease at times since the summer of 1917. They say that it became rather prevalent in September. It is believed by some that the germ of influenza, like that of some other diseases, is constantly present in every large community; that it is not always virulent, but under certain conditions it acquires increased virulency.

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If the organism which has caused the present epidemic has long been in existence in the Oglethorpe camps, it is not apparent why it has suddenly become so active. It would seem that the conditions for its epidemic prevalence have existed for a long time. Recent weather conditions, uncomfortable as they have been, have not been so disagreeable as they were in January. The theory that the explosion is of local origin needs a better explanation than can apparently be given.

The weather was cloudy, damp and chilly. It was not cold nor wet, but the nights, and especially the mornings, were decidedly damp and uncomfortable. The difference between the air indoors and outside was marked. Drafts were particularly noticeable.

Reviewing these facts about the weather, it cannot be said with certainty that the conditions of temperature and humidity have had much to do with the epidemic, nor can it be denied that they played an important part in predisposing the troops to attack. Obviously, the weather conditions have led the men to gather together indoors, where they have been especially exposed to infection from one another, and it has had a chilling effect, which is an important factor in the progress of all respiratory infections.

An inquiry was made to ascertain whether the troops were exposed in an unusual degree to the weather, to excessive fatigue, or in any other manner before or after the epidemic started. This line of investigation brought no suggestive information to light.

No exceptional prevalence of influenza or other similar infectious disease has existed in Chickamauga or in the extra-cantonment zone. An effort was made to shed light on the identity of the disease by studying the record of other cases of sickness which had been sent to the hospital under the designations of "fever, type undetermined," and "influenza" during the six months preceding the epidemic. These designations have never been definite; they have seldom been based on conclusive evidence at the hospital. Bacteriological examinations have seldom proved the influenza bacillus to be the causative agent of the cases called "influenza." From time to time this bacillus has been found in the secretions of the nose and throat of troops, but has not been proved to be the cause in any large amount of sickness. "Fever, type undetermined," and "influenza" have been merely convenient expressions by which to designate cases of an indeterminate sort which demanded treatment and had to be called something.

Of a series of 161 cases of "fever, type undetermined," sent to

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the hospital before the present epidemic broke out, 59 turned out to be bronchitis and 41 pneumonia; 61 were called "influenza." In some instances "fever, type undetermined," had been found to be measles, scarlet fever, otitis media and meningitis. Out of 189 cases diagnosed "influenza" at the regiments, 150 turned out at the hospital to be some other disease.

It is probable that the epidemic disease was recently brought to these camps. If it is genuine influenza, and the epidemiological features no less than the leading symptoms seem to point to that disease, there is here offered the most reasonable explanation of the outbreak which is now possible. No other disease spreads so fast or is so prostrating, considering its symptoms. Influenza may be nearly explosive in character; it spreads as rapidly as personal communication permits. Personal contact is intimate in the Oglethorpe camps, especially between men in companies and regiments. To some extent the regiments keep separate, but there is a general mixing at places of amusement in camp and in Chattanooga. It is worthy of remark that the regular Officers' Training Camp is an organization which mingles but little with others in the Oglethorpe camps, and that here the epidemic was late in appearance. The same may be said of a part of Camp Greenleaf. The war prison camp is entirely separate and escaped infection. The epidemic seems to have burned out for want of suitable material, probably with the gradual but rapid decrease in virulence.

Reviewing the whole subject, it may be said that an epidemic of influenzal disease became prevalent in the Oglethorpe camps toward the latter part of March, 1918. The identity of the disease has not been positively determined after nearly a month of observation. It may have been an outburst of a form of sickness which has long existed in sporadic form in these camps. It may have been brought to the camps from outside. The weight of evidence is in favor of the latter theory.

It is a highly infectious disease with a short period of incubation. The weather has encouraged the epidemic, but is apparently not responsible. The disease is respiratory in type, with a strong resemblance to influenza in some of its most characteristic symptoms, notably the fever, pain in the back and legs, and great prostration.

The cause of the rapid spread undoubtedly lies in the great infectivity of the causative agent, its short period of incubation, and the intermingling of the troops. One thing seems clear—the disease could never spread unless the buccal or nasal discharge of the sick

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got into the mouths or noses of susceptible persons. The nature of the epidemic seems to show the extent to which this interchange takes place under the conditions which surround these troops.

ANALYSIS OF CAUSES OF DISEASE IN THE ARMY

In the preceding pages we have set forth the primary data of disease incidence in the Army as a whole and for certain National Guard and National Army camps. It has been pointed out that respiratory disease has prevailed to a much greater extent in the Army than in civilian life. In the Army 77 per cent of all deaths were caused by this group of six diseases during the period covered. In civilian life but 43 per cent of all deaths in a comparable age group are due to respiratory disease.

The most important of these six diseases is pneumonia, in that about 80 per cent of the deaths from the respiratory group are attributable to this one cause. Meningitis is second in importance in being responsible for 15 per cent of the deaths in the respiratory group. This leaves but 5 per cent of the group to be accounted for by the four other diseases—tuberculosis, measles, scarlet fever, and diphtheria.

Pneumonia and meningitis are important, not only because they cause so many deaths, but because the excess of these two diseases over that in civil life is more pronounced than the excess of other diseases in the Army over their extent in civil life. In the calculations made, meningitis was seen to be forty-five times greater in the Army, pneumonia twelve times greater. Measles was nineteen times greater in the Army, but this is not of as great significance as with the other two, as the outcome is less often fatal. Scarlet fever and diphtheria are only slightly more prevalent in the Army than in civil life. It is the underlying cause of this excess disease incidence in army camps that we are particularly interested to discover.

We have noted that there is a wide variance in the rates at the different camps, and, although the average for all troops is raised by excessive rates in a few camps, the majority of the camps still have rates appreciably above the rate for civil life. Certain influences thus seem to be acting on all camps, and certain other influences are confined to a certain group of camps. We may classify these influences under three main heads. The prevalence of disease may be attributed to one or more of these causes:

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1. Weakening of the Resistance of the Soldier Due to—
(*a*) Exposure to severe weather.
(*b*) Insufficient clothing.
(*c*) Inadequate housing, lack of heat.
(*d*) Fatigue.
2. Unusual Facilities for the Transmission of the Infective Agent by—
(*a*) Close contact with carrier cases.
(*b*) Undetected cases among new recruits.
(*c*) Importation of mildly sick men and carriers from other camps.
(*d*) Association with civilian community.
(*e*) Overcrowded quarters.
(*f*) Inadequate hospital care of patients.
(*g*) Unsanitary conditions in general.
3. Natural Susceptibility to Disease—
(*a*) Racial influence.
(*b*) Effect of rural life.
(*c*) Climatic influence.

Influence of Those Factors Which Bring on Physical Debility

Under this heading we may consider the influence of those factors which lower the physical tone of the body and make the natural defenses of the body less resistant. The recruit fresh from civilian life undergoes a considerable change in his mode of living on entering camp. There he becomes a part of a vast machine. He has less opportunity to cater to his personal wants. He is out of doors more. He is apt to become chilled or wet. He sleeps in colder quarters, and not only sleeps, but lives, eats, undresses and dresses, bathes, etc., in colder quarters. Being out of doors more, his appetite is greater. He eats more heartily. He is inclined to overeat. In his desire to get ahead in competition with his associates, he is apt to work harder, to become unduly fatigued. When indoors, in an effort to keep warm, he joins the crowd about the stove. He may be subjected at times to overheated atmospheres.

Each and all of these influences tend to pull down the physical resistance of the recruit. They put a strain upon him, *and especially so upon the man who hasn't been used to this sort of thing.* It is the untrained individual who feels the rigors of camp life most keenly.

With a realization of this state of things, we may consider to

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what extent these factors have acted at the different camps. First, we are confronted with the facts so strikingly illustrated in the charts, namely—

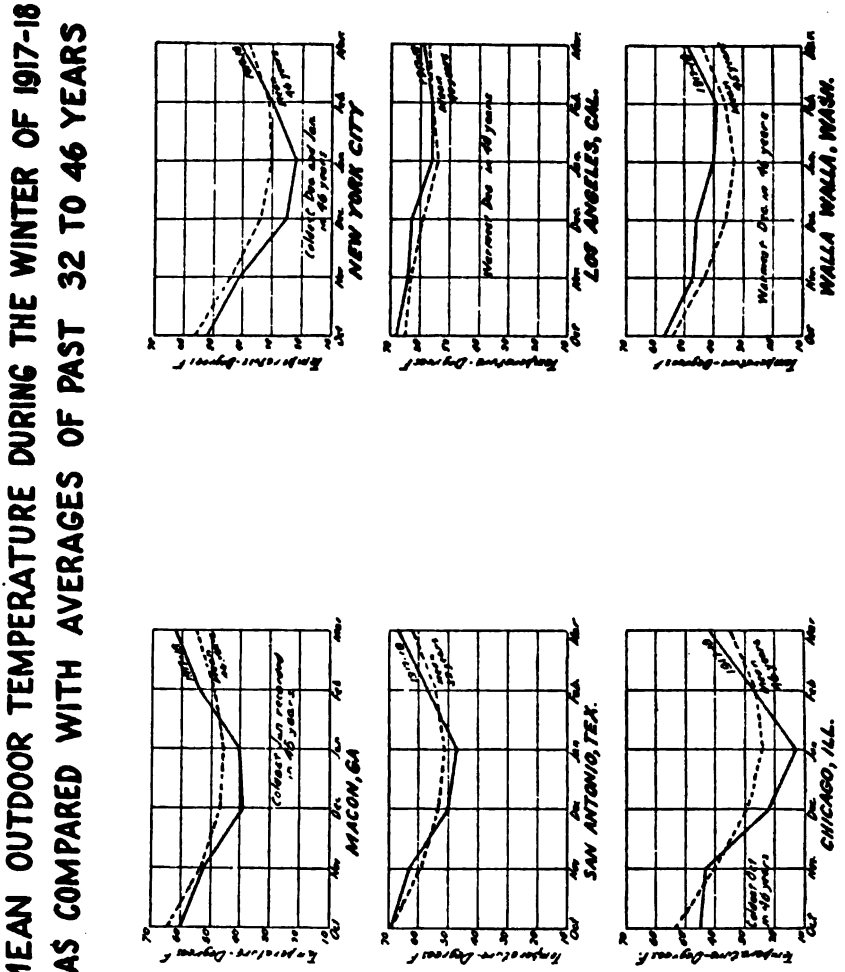
MEAN OUTDOOR TEMPERATURE DURING THE WINTER OF 1917-18
AS COMPARED WITH AVERAGES OF PAST 32 TO 46 YEARS
NEW YORK CITY
LOS ANGELES, CAL.
WALLA WALLA, WASH.
MACON, GA.
SAN ANTONIO, TEX.
CHICAGO, ILL.

CHART XIII

The morbidity rate from pneumonia is *greatest* in Camps Bowie, Wheeler, Travis, Pike, and Cody.

The death rate from all causes is *greatest* in Camps Pike, Wheeler, Beauregard, Bowie, and Jackson.

The morbidity rate from meningitis is *greatest* in Camps Jackson, Beauregard, Funston, Doniphan, and Bowie.

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The morbidity rate from measles is *greatest* in Camps Pike, Bowie, Wheeler, Sevier, and Beauregard.

The death rates from all causes are *lowest* at Camps Sheridan, Hancock, Wadsworth, McClellan, and Logan.

The morbidity rates from pneumonia are *lowest* at Camps Sheridan, Wadsworth, Dix, Custer, and Hancock.

The morbidity rates from meningitis are *lowest* at Camps Wadsworth, Logan, Devens, Dix, and Upton.

The morbidity rates from measles are *lowest* at Camps Dix, Lewis, Hancock, Wadsworth, and Upton.

In the face of the above, we should expect that if exposure were a factor in increased disease incidence, that the exposure was the same at each of the camps where disease was prevalent, and that this exposure was entirely different from that at the camps where disease was rare. We may examine this point further.

(*a*) *Weather.*—The weather of the past winter has been unique in some respects. East of the Rocky Mountains, the temperature in general has been the coldest in forty-six years. West of the Rockies it has been the warmest in forty-six years.

At Macon, Ga., October, 1917, was the third coldest October, and January, 1918, was the coldest January in forty-six years. January was an unusually cold month at San Antonio, Tex. October, 1917, was the coldest and January, 1918, the third coldest in Chicago for forty-six years. December, 1917, and January, 1918, were the coldest New York City has seen for forty-six years.

At Los Angeles, Cal., the year 1917 witnessed the warmest December in forty years, and this holds true for Walla Walla, Washington. Weather data are reported graphically in Chart XIII.

If low temperature had been a prime factor in the cause of disease, we should expect the northern camps to suffer most, the southern camps next, and the far western camps, Kearney and Lewis, where the weather was warmer than usual, least. This is not the case by any means. Camps Devens and Upton are probably the coldest camps, and yet their disease incidence has been among the lowest.

The possibility of undue exposure to weather and its consequences is suggested in the reports from Camp Travis. Speaking of pneumonia, a report reads that "the majority of the cases stated that their colds commenced after being chilled while on guard or at drill or when cold during the night, and that these colds commenced at or about the dates of 'Northers' and a sudden drop of temperature.

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The exposure and chilling is rather significant as a predisposing cause of pneumonia in this camp. It will be noted that no cases occurred in the Quartermaster Corps, Ordnance Corps, Base Hospital personnel, Bakers' Company, and the Bakers' and Cooks' School. Neither have any of the 1,758 officers of this camp had pneumonia. These organizations are not required to do drill or guard duty. Their duty is mostly indoors, while other organizations are exposed to the cold, wind and dust. With the exception of the above named organizations, pneumonia is widely distributed throughout the camp."

Reports from Camp Beauregard state that there was a direct relation between the epidemic of pneumonia and the severity of the weather, the epidemic subsiding with improvement of the weather.

Severe weather undoubtedly caused trouble in some camps, but this was not the controlling factor by any means.

Camps Bowie, Beauregard and Logan experienced about the same climatic conditions. The annual pneumonia morbidity rates per thousand for the first two years were 96 and 42, respectively. That for Logan was 16.

Camp Pike is in about the same latitude as Camp McClellan. The pneumonia rate for the former was 63, that for the latter 9.6.

Camp Wheeler and Camp Sheridan faced the same weather. The pneumonia rate for Wheeler was 95, that for Sheridan 9.3.

Camp Jackson is close to Camps Wadsworth and Hancock. The former is high in the disease table, the latter low.

We are aware of the fact that we are leaving this question of the relation of the weather to the acute respiratory diseases, and especially to pneumonia, in a very unsatisfactory state. There are strong reasons for believing that the incidence of pneumonia is greatly influenced by weather conditions. Curves showing weather conditions as influencing pneumonia, in some of the camps, are striking, and this evidence comes from camps as far apart as Sevier and Upton. We hope that more attention will be given to this matter in future studies on the epidemiology of pneumonia.

(*b*) *Insufficient clothing.*—Associated with the question of weather severity is that of inadequate clothing. The severity of the winter is felt less if the men are provided with plenty of warm clothing. There are a number of instances where the lack of winter clothing was felt, specific mention of this being made at Camps Sevier, Wheeler, Logan, Bowie, Sheridan, Shelby, Beauregard, Kearney, Devens, Dix, Lee, Jackson, Custer, Pike, Dodge, Funston and

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Travis. This factor without doubt increased colds, which may in turn have led to pneumonia. For instance, at Camp Jackson, as late as January, it was reported that "many men . . . are seen going about in cotton clothing, despite freezing weather." At Pike we note the following from the report of an inspector: "The clothing of all the men in November and December according to the records was not complete. Many men were undoubtedly exposed to changes in temperature which caused a lowering of their resistance, thereby making the spread of infectious disease much easier."

The onset of measles and pneumonia at Camp Sevier was attributed to exposure to weather and lack of clothing. The report reads: "During the latter part of October a sudden drop in temperature occurred, causing considerable discomfort of the troops, many of whom were poorly clad. It was at this time a large increment of draft men was received. Many of these recruits had been exposed to measles; they were poorly nourished. The sudden exposure of these troops in this condition resulted in many cases of pneumonia, many deaths occurring."

Judging from this, Jackson, Pike and Sevier suffered from lack of clothing. These camps have high disease incidence. But clothing shortage was by no means peculiar to those camps with high disease incidence. Referring to the previous list we note that Logan, Sheridan, Devens and Dix are also included, and yet these camps had relatively little sickness. In November at Sheridan "few men had woolen underclothing or overcoats," and men could not sleep at night because the two blankets provided were insufficient to keep them warm. At Devens, as late as December, we learn from the report of inspectors that the clothing of men was insufficient, and that "there is much suffering from cold and many cases of frozen ears and fingers are incurred by men on duty in weather below zero without winter gloves and ear protectors."

Lack of clothing was a contributing factor in disease incidence, but it is not believed that this cause was responsible for the peculiar distribution of diseases in the different camps.

(*c*) *Inadequate housing and lack of heat.*—In addition to lack of warm clothing there was also felt the lack of warm quarters. It is aggravating and debilitating to be cold when out of doors at work, but it is even more serious when there is no opportunity to retire for a time to warm quarters. In some instances lack of fuel made it impossible for men to keep warm indoors during day and night. But here again there is no evidence that Pike, Beauregard,

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Wheeler and similar camps suffered more from this cause than Logan, Wadsworth, Devens or Upton. If anything, the northern camps would suffer more in this respect and yet the northern camps had less disease. Similarly, if lack of fuel and cold quarters were a controlling factor we should expect the National Guard camps to show more disease because of their tent quarters, but this is not the case.

(*d*) *Fatigue.*—It is well known that overwork leading to excessive fatigue lessens resistance to disease. In view of the previous life of many recruits who have come from offices and factories, it is probable that the vigorous outdoor life of the camp, introduced suddenly, pulled down the general body resistance. Here again, however, we must point out that the records at hand do not show that fatigue was any more a factor at Pike, Beauregard, Bowie and allied camps than at Logan, Devens, Sheridan and others of this type.

The report from Wheeler is that "fatigue has not been a factor" in disease incidence. From Wadsworth we are informed that "fatigue has been a contributing factor in the etiology of respiratory diseases, but a very minor one." Essentially the same conclusions are obtained from those familiar with the situation at Lee and Lewis.

The Division Sanitary Inspector at Travis believes "that men upon entering military service are subjected to a too strenuous program of drills for the first four weeks. It would be better if the first four weeks of military service were given over to light exercise and short periods of drill which could be slowly increased; this would give the men a chance to better accommodate themselves to the new life and the body a chance to build up physical resistance against disease."

In general, fatigue has evidently made troops somewhat more susceptible to disease, but this has been a general tendency and not one peculiar to any particular group of camps.

Influence on Disease Incidence of the Unusual Facilities for the Transmission of the Infective Agent, Afforded by Camp Life

(*a*) *Close contact with carrier cases.*—The bringing together of men from all sections into camps naturally increases the possibility of contact transmission of disease. It will be readily appreciated that a carrier of the meningococcus can do more damage in an army camp of 30,000 than he could on a farm where his association is limited to few individuals. The prevalence of sickness in

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the various camps has without question been augmented by the presence of individuals who are themselves well, but who carry in their noses and throats the germs of the respiratory diseases; but there is no reason for believing that the number of such carrier cases is so much greater among the men of Camps Pike, Beauregard, Wheeler, Bowie, Jackson, than among the men of Camps Logan, Hancock, Sheridan, Wadsworth or McClellan. In other words there is no indication that the germs of respiratory disease are any more widespread to begin with in the former camps than in the latter.

To check up this point we need statistics on the number of carriers among the civilian population in these various districts, and this material is lacking.

The importance of the carrier is a mooted question. In view of the great number of carriers of certain diseases who have been discovered, it is a question whether or not it is practicable even to attempt their detection and eradication. It seems more likely that immunity or physical resistance is more potent a protective force than efforts toward keeping away from the germ itself.

There were found at Camp Travis, during January, 112 positive meningococcus throats among 3,159 men examined. This amounts to 3.5 per cent of positive carriers. This number of carriers in one month is nearly three times the number of actual cases of meningitis reported from Travis for the *entire six months.*

At Camp Jackson 8 per cent of all hospital admissions were found to have positive meningococcic throats. As this is a higher percentage than is found among the population at large, it is believed by the epidemiologist at Jackson that a lowering of the physical tone renders one more receptive to the meningococcus.

At Camp Bowie, during February, seven cases developed among 114 carriers. If the persons coming in contact with this number of carriers had not possessed immunity to this disease the cases would have been much more numerous.

It is reported from Camp Grant that diphtheria carriers accumulated there at one time to the number of one hundred. They were quartered at the base hospital while continued unsuccessful efforts were made to clear up their throats. Finally, in desperation, almost all of these men were turned loose and returned to duty with their companies, and no increase in diphtheria occurred as a result.

(*b*) *Undetected cases among new recruits.*—In a sense this matter has already been covered in the previous discussion. There is a

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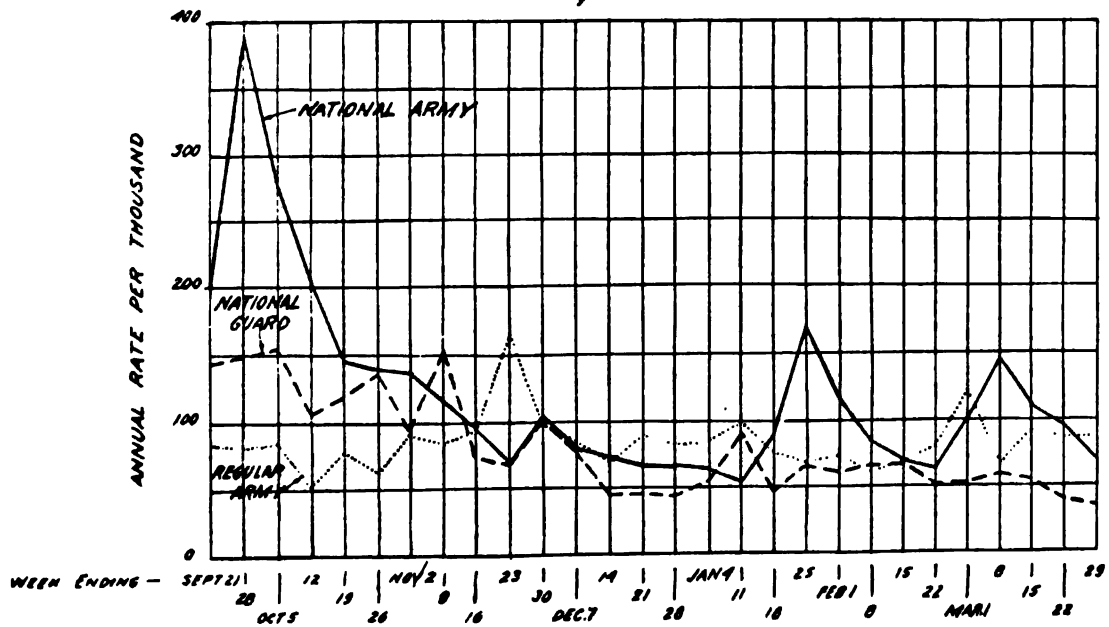
VENEREAL DISEASE IN THE THREE GROUPS OF THE U.S. ARMY

WEEKLY INCIDENCE EXPRESSED IN TERMS OF ANNUAL CASE RATE PER 1000

SEPT. 1917 TO MAR. 1918 INCL.

CHART XIV

NOTE: The influence of the new recruit is suggested by the high rate for the National Army



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new problem introduced here, however, in that men fresh from civilian life are likely to act as foci of infection.

Pneumonia, measles and meningitis are to be found widely spread over a state. There is scarcely a county wholly free from these diseases at any one time. The gathering of the drafted men brings in many who are either coming down with the disease or who are carriers.

Reports from Wadsworth state that "new troops shortly after arriving in this camp generally showed quite a large number of sore throats. These would disappear after the troops had been in camp for several weeks."

Reference has already been made to the onset of measles and pneumonia at Sevier coincident with the coming of new draft men. Sevier "was practically free of all communicable diseases until the influx of the draft men from Camp Jackson; our first measles case appeared at this time, in the early part of October. Scarlet fever did not appear in this camp until troops arrived from Jefferson Barracks, Missouri."

The Division Surgeon at Camp Wheeler in a published report describing the epidemic of measles and pneumonia there, states that "draft men brought measles on every train." "Six cases were taken from one train."

This factor is especially noticeable in the case of venereal diseases. The admission rate from this cause went up enormously in the National Army with the accession of new men. As time went on this fell off until the rate was no higher than that for the Guard or Regular Army. This fact is graphically shown in Chart XIV.

New men increase disease in camp, but this cause should act no differently in one part of the country than in another.

(*c*) *Importation of mildly sick men and carriers from other camps.*—More striking than the association of disease with new recruits has been the association with importations from other camps. There has apparently been an endeavor on the part of some to weed out the undesirables and ship them along when the call for transfer has come. This has been complained of at many camps, and that there are just grounds for this complaint is evidenced by the many instances of sick men being found among troop arrivals. This is an influence which would react differently on the camps. Thus, if one camp is gradually being recruited in strength and not shipping men away it may at the same time accumulate an abnormal proportion of physical weaklings. Or a camp may act as a mobilization center

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both receiving and shipping troops. If there are sick men among the arrivals, these are filtered out and an undue accumulation of hospital admissions will take place, sending the rate up above that of a relatively closed camp. It is felt that Funston and Dodge have suffered notably in this respect.

An examination of how this works may be taken from the experience at Camp Sheridan, occupied almost entirely by Ohio National Guardsmen. In April a contingent of over 700 men were received from Camp Travis. Immediately on detraining a physical examination of this group was made and revealed the following:

Venereal disease	40 cases.
Mumps	3 cases.
Measles	8 cases.
Pneumonia	2 cases.
Meningitis carriers	27 cases.
Trachoma	2 cases.

These cases should have been discovered before this contingent left Texas and the infected persons isolated from the rest. By reason of the failure to do this the infection spread while in transit, and there appeared shortly after, in addition to the cases examined on detraining, the following:

Venereal disease	8 cases.
Mumps	37 cases.
Measles	6 cases.
Diphtheria	2 cases.
Pneumonia	8 cases.
Meningitis carriers	40 cases.

Reports from Camp Beauregard, relating to meningitis and measles, indicate that the epidemic started with the arrival of troops from Camp Pike and the state mobilization camp of Mississippi.

At Camp Pike, on the other hand, the blame is laid to other camps. "A study of the character of material received from other camps shows that in many instances physical derelicts were sent to Camp Pike." Contributing to Pike were troops from Custer, Funston, Grant, Sherman, Taylor and Dodge.

Reports from Camp Wadsworth state that "among these troops received from Camps Taylor, McClellan and Fort Oglethorpe, one case of meningits and one case of measles were taken from the train on which the troops arrived."

Speaking of the new increments from Camp Taylor, this report

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goes on to say that the non-effective rate for this new group went up about 79 per 1,000, whereas the non-effective rate for the division previously was around 24.

Introduction of scarlet fever, measles and mumps are all attributed to importation of men from other camps by the epidemiologist at Camp Upton. These diseases were present among a small increment from Camp Dodge. On distributing these men about the camp these diseases began to appear in those organizations to which they had been assigned.

At Camp Cody the entrance of epidemic diseases is attributed to new accessions. Thus "measles and German measles . . . followed shortly after the arrival of troops from Camp Dodge."

The epidemiologist at Custer reports that many of the new arrivals entered camp suffering from acute respiratory infections or promptly developed them. "The succeeding incidence of pneumonia was principally among the unseasoned troops."

(*d*) *Infection from the surrounding civilian community.*—Disease has been introduced into camps from the civilian community. This may occur in camps long established and among troops who have been in the service for some time.

Data from Camp Upton are interesting in this connection. Five cases of measles occurred in the 304th Field Artillery. The first man had been home in Philadelphia two weeks previously. The second man had been home in Sussex, N. J., sixteen days previous to his admission to the hospital. The third man sent to the hospital on April 16 had been home in Olean, N. Y., from April 3 to April 6. Data are incomplete in the other two cases. This evidence points to infection from civil life.

The epidemiologist at Camp Beauregard states that meningitis was prevalent in the civilian community around the camp and was responsible for its introduction into the camp. This was also true for measles.

Transmission of scarlet fever in this manner has been discussed at length on page 291.

(*e*) *Overcrowding.*—The early mobilization of the National Guard troops resulted in a great amount of overcrowding. There are instances of ten or more men to a tent that accommodates comfortably not more than five or six. This herding together of the men permitted unusual opportunity for transmission of the disease from one person to another by contact, sneezing and coughing, and infected dust.

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Specific instructions were issued to provide quarters which would give each soldier at least 500 cubic feet of air space. Just how serious this crowding was as a factor in spreading disease is a question. That it was responsible to a certain degree there is little doubt, but it is a very significant fact that there were remarkably few instances of more than one case of pneumonia or meningitis in the same tent. If this unusually intimate association of the men had been a controlling factor we would expect not one but four, six and eight cases to a tent.

In this connection it must be pointed out also that overcrowding occurred in those camps with little disease incidence as well as in those with high disease incidence. Crowding was by no means confined to the camps with excessive sickness.

A special inspection made at Camp Wadsworth in January showed instances of nine men to a tent. There should not have been more than five in order to allow 50 square feet of floor space per person. This camp had a relatively low disease incidence.

Camp Logan had but 28 square feet of floor space per person for a long while. Camp Lee had as many as fifteen men to a tent as late as November. Excessive sickness in certain of the southern camps cannot be charged to this cause.

On the other hand, while crowding is not a controlling factor, it has been undoubtedly an incidental factor, as evidenced by the difference in disease incidence between officers and men, the latter being brought into much more intimate contact with one another than the former (see Table XXVI).

In morbidity from measles the enlisted men exceeded the officers by appreciable proportions in every one of the eleven camps. Pneumonia morbidity has been greater among the men in nine camps. Meningitis and scarlet fever were more prevalent among the men in all except one instance, meningitis at Beauregard being greater among officers. Deaths from these diseases were so few among the officers as to make any comparison of rates uncertain. Accepting the figures as they are, however, we find that deaths among the men were greater in 27 out of 44 cases.

It is of interest to note that at Wadsworth, Grant, Custer, Meade and Travis the excess of measles was about two or three times greater among the men. At Pike, Beauregard, Lee and Jackson the ratio is nearer 10 to 1. It would appear from this that the men at the latter camps are much more susceptible to the disease. There is no such big divergence between officers and men for pneumonia.

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TABLE XXVI.—*Comparative Morbidity and Mortality Among Officers and Enlisted Men (Six months, September 29, 1917, to March 29, 1918)*

(Figures in annual rate per 1,000)

Camp	Measles				Pneumonia			
	Cases		Deaths		Cases		Deaths	
	Officers	Men	Officers	Men	Officers	Men	Officers	Men
Wadsworth	2.2	7.9	0	0	4.3	9.1	2.2	1.1
Dix	4.8	34	0	0	9.5	8	3.6	1.5
Grant	26	50	0	0.08	4	14	2	1.5
Custer	21	65	0	0.49	8.2	7	2.7	1.5
Meade	25	36	1.1	0	3.2	18	2.2	2.6
Lee	5.9	85	0	0.19	18	24	9.8	5.5
Gordon	33	168	0	0.21	4	15	1.3	5.3
Jackson	36	230	0	0.33	5.9	36	0	11
Travis	66	*124	0	0	7.1	78	1.2	11
Pike	35	390	0	0.15	32	63	1.3	25
Beauregard	28	256	0	0.11	21	42	0	15

Camp	Meningitis				Scarlet fever			
Wadsworth	0	0.8	0	0.20	0	0.8	0	0
Dix	0	0.6	0	0.19	2.4	6.4	0	0.09
Grant	1.0	1.3	1.0	0.31	6	12	0	0.23
Custer	0	1.8	0	0.30	0	6.5	0	0.2
Meade	1.1	2.4	0	0.66	4.2	7.7	0	0.07
Lee	2	2.7	2	1.2	0	0.8	0	0
Gordon	1.3	3.6	0	0.96	0	0.1	0	0
Jackson	5.9	26	1.2	7.5	0	0.9	0	0
Travis	1.2	2.7	1.2	2.5	0	0.4	0	0
Pike	0	3.8	0	2.4	7.9	44	0	0.44
Beauregard	28	12.8	19	7.7	0	0	0	0

* Many cases not reported.

Meningitis shows still less difference between officers and men. Scarlet fever is somewhat too irregular to summarize. One interpretation offered for the peculiar characteristics of the first three diseases is that measles is much more readily transmitted and that susceptibility to this is quite general among certain troops. Pneumonia and meningitis, especially the latter, are less readily spread by contact, and susceptibility is not at all general.

It must also be pointed out that what holds true for the enlisted men is likewise true for the officers so far as distribution of disease at the various camps is concerned. Wadsworth has the lowest

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measles incidence among both officers and men. Pike has the highest incidence among men and one of the highest rates for officers. In general this holds true for the other camps. The camps with high disease incidence among the men likewise have high disease incidence among officers.

(*f*) *Inadequate hospital care.*—An effort has been made to de-

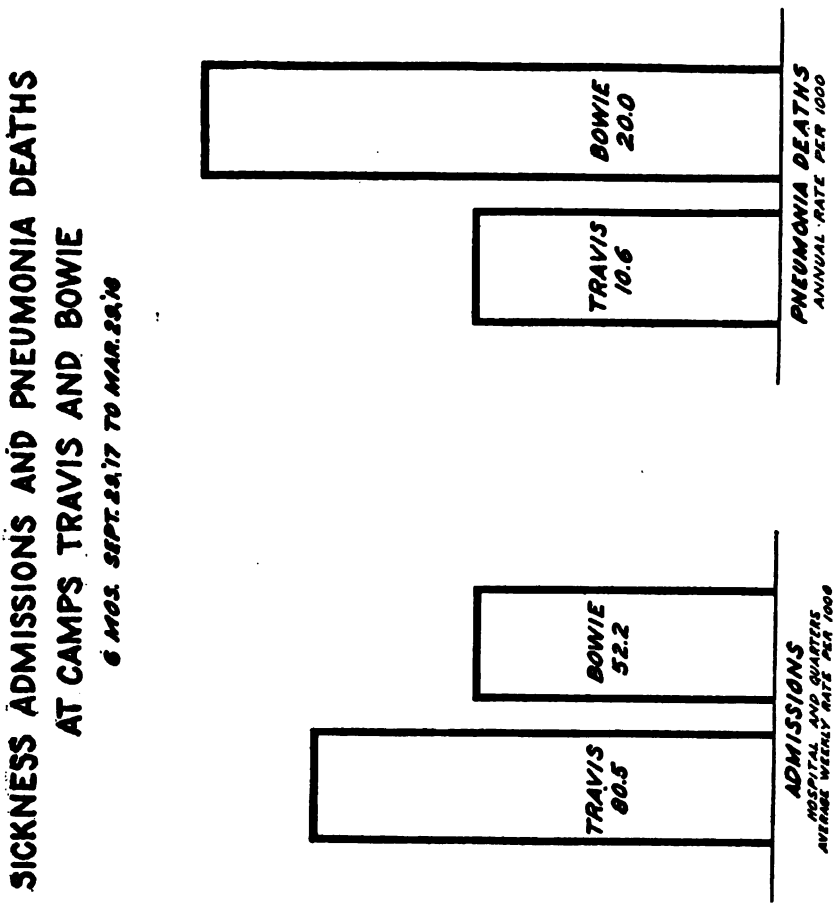

CHART XV

termine whether lack of hospital accommodations has caused an excess of disease in any one camp. It is believed that this has acted to a certain degree, there having been a few instances of contact transmission within the wards. This has been corrected by more complete isolation of cases. Some camps have suffered more in this

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respect than others, but this has been a relatively slight factor in the general dissemination of disease. Lack of hospital facilities would seem to account for the excess of disease at Bowie over Travis, both camps receiving men from the same states. Bowie was cramped

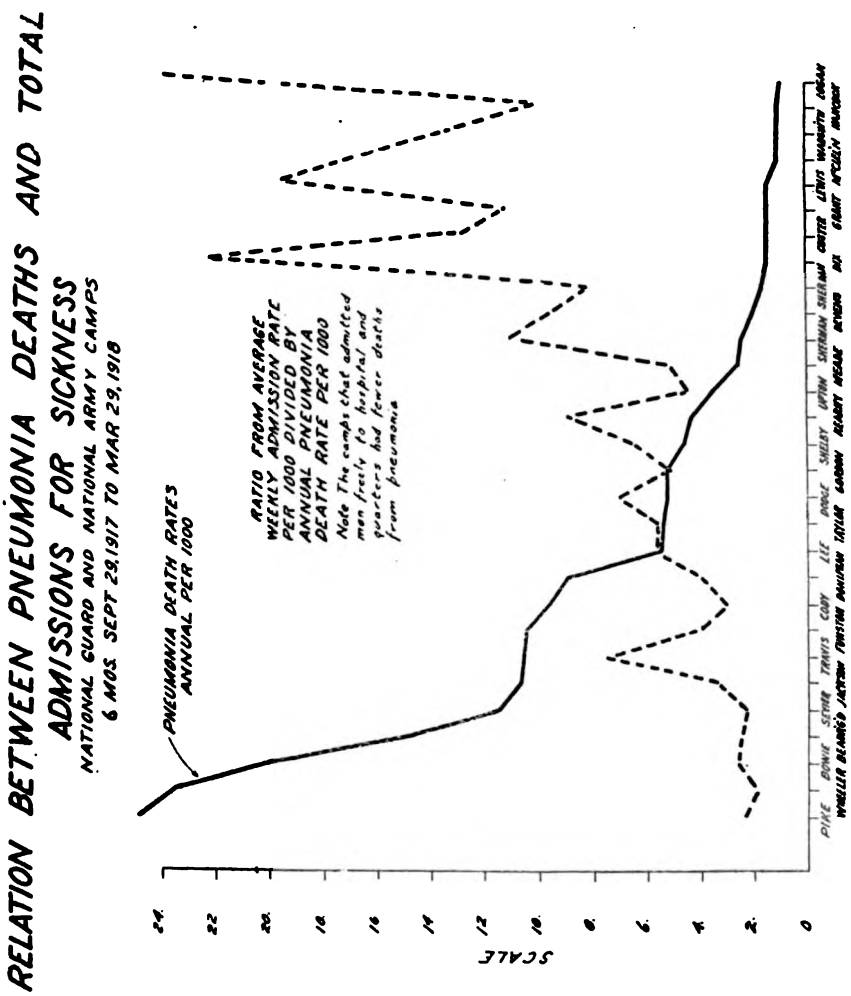
RELATION BETWEEN PNEUMONIA DEATHS AND TOTAL ADMISSIONS FOR SICKNESS
NATIONAL GUARD AND NATIONAL ARMY CAMPS
6 MOS SEPT 29,1917 TO MAR 29,1918
PNEUMONIA DEATH RATES ANNUAL PER 1000
RATIO FROM AVERAGE WEEKLY ADMISSION RATE PER 1000 DIVIDED BY ANNUAL PNEUMONIA DEATH RATE PER 1000
Note The camps that admitted men freely to hospital and quarters had fewer deaths from pneumonia
SCALE
0 2 4 6 8 10 12 14 16 18 20 22 24
PIKE BOWIE SEVIER TRAVIS CODY LEE FUNSTON SHELBY UPTON SHERMAN SHERIDAN CUSTER LEWIS WADSWORTH DODGE
WHEELER BEAUREGARD JACKSON FORREST BANCROFT TAYLOR GARDNER ROBERT MCCLAIN KEARNS MC GRANT MCCLELLAN MACARTHUR

CHART XVI

for hospital room and cases could not be handled as carefully as at Travis, where the accommodations were more ample. With such facilities Travis was able to send incipient respiratory infections to the hospital and thus prevent the development of more serious ill-

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ness. Bowie could not do this and had, partly in consequence, nearly twice as many deaths from pneumonia. This result is illustrated in Chart XV. In Chart XVI is shown the apparent universal influence which treatment of the minor diseases has on the death rate from pneumonia.

Faulty quarantine at some camps is believed to have been a factor in disease transmission. Quarantine can be kept in spirit or only literally. There are a number of instances where little else was done than to issue the order. There was no following up of the order nor any serious attempt to abide by it.

(*g*) *Unsanitary conditions in general.*—Respiratory disease is affected by general or personal sanitation. Inasmuch as the infective agents gain access to the body through the mouth and nose, it is important to observe those matters of personal hygiene such as the avoidance of promiscuous spitting, of trading pipes and mess utensils; to wash the hands before meals, etc. Evidence along these lines is not exact or complete, but the observation has been made that in certain of these camps with high disease incidence, the men are in general more careless of their personal habits. They are not as cleanly. Spitting outdoors and indoors is of the most promiscuous character. Food is less carefully prepared and its choice is a matter of less concern than in other camps. Promiscuous and well-nigh universal spitting on the streets, about and in tents, on parade grounds, etc., has been reported at Bowie. Pneumococci have been found in dust.

Natural Susceptibility to Disease

Having considered the effect of camp life in weakening the physical tone of the soldier and the extent to which infectious disease has been spread, we come to a consideration of the innate susceptibility of the soldier or his natural immunity to disease.

If this factor is a predominating one, we should expect those men who are exposed to the same general climatic influences to show similar characteristics. Or we should expect like tendencies to be exhibited by men from the same section of the country. Still further, we might look for differences between city men and country men.

(*a*) *Racial influence.*—The high incidence of disease at southern camps such as Pike, Wheeler, Beauregard, Jackson, Bowie and Travis suggests that the number of negro troops there may have something to do with it, for the statistics in civil life show the negro

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to be much more susceptible to such diseases as tuberculosis and pneumonia.

Reports from Wheeler and Beauregard show that there were no negro troops there during the six months covered by this study. At Travis the proportion of white to colored troops was seven to one, and the sick rates were no greater among the latter than among the former. About 25 per cent of the troops at Pike were colored. The sick rates among colored troops here was greater than among whites. We have no data as to the proportion of colored troops at Jackson, but we believe it was very small indeed, if in fact there were any at all. With northern bred negroes at Logan there was but little difference in the sick rate between the races; with southern bred negroes in northern camps both the morbidity and mortality rates were much higher among the negroes.

There is thus no ground for attributing the excessive sick rates at the southern camps to colored troops.

(*b*) *Effect of urban life.*—It is a well-recognized fact that respiratory disease is more common in centers of population, where its means of transmission is so much readier, than among the rural population. The table below well illustrates this fact and these data are typical.

TABLE XXVII.—*Urban and Rural Death Rates*, 1915

(Annual rate per 100,000)

	Measles	Scarlet fever	Diphtheria and croup	Pneumonia	Tuberculosis of the lungs
Cities in registration states	7.1	4.0	17.5	156	134
Rural part of registration states	3.4	3.1	12.9	106	112

Analyzing the situation in the army with this question of population in mind, we are brought face to face with some very interesting facts. These are illustrated in Chart XVII. Here we have compared the death rates among the soldiers from different sections of the country with the percentage of rural population of that section. The association of high disease incidence and rural population is very suggestive.

The death rates are distributed roughly in three groups. Those representing the West South Central section, the East South Cen-

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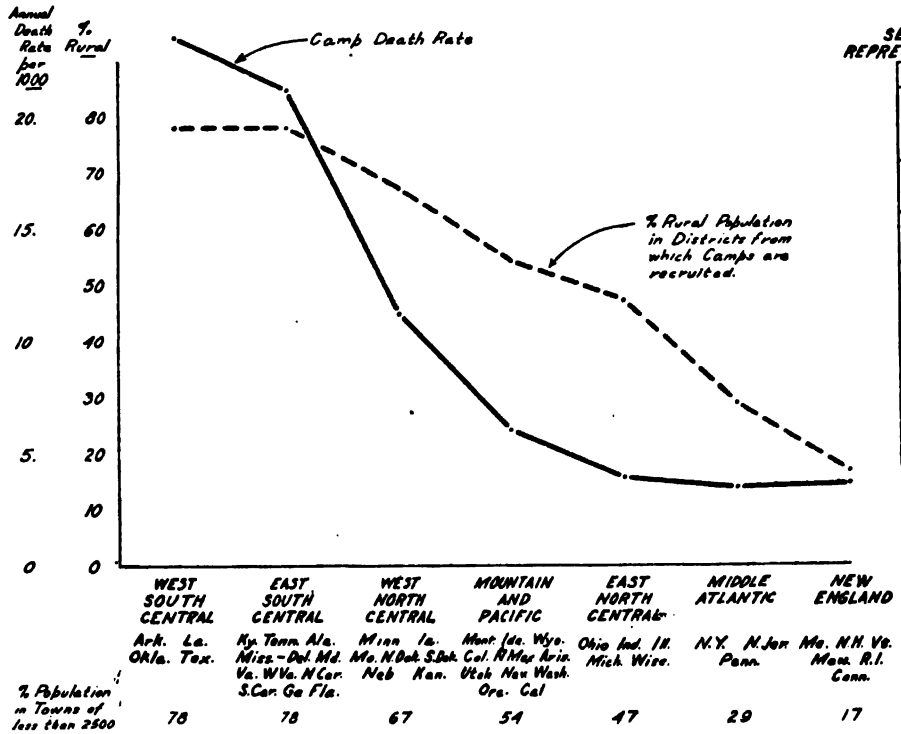
RELATION BETWEEN RURAL LIFE AND DEATH RATES AT NATIONAL GUARD AND NATIONAL ARMY CAMPS

CHART XVII



SECTIONS OF COUNTRY REPRESENTED IN FOLLOWING CAMPS

SECTION	CAMP	DEATH RATE	
W.S.C.	Pike	30.7	
	Beauregd	25.4	23.6
	Bowie	23.1	
	Travis	15.3	
E.S.C. and S.A.	Wheeler	26.3	
	Jackson	19.9	21.2
	Sevier	15.5	
W.N.C.	Cody	12.7	
	Doniphan	11.9	11.2
	Dodge	9.1	
Mt and Pac.	Kearny	8.1	6.1
	Lewis	4.1	
E.N.C.	Sherman	5.4	
	Custer	5.1	
	Grant	3.8	3.9
	Sheridan	2.8	
	Logan	2.3	
M.A.	Upton	5.3	
	Hancock	2.6	3.5
	Wadsworth	2.5	
N.E.	Devens	3.7	

NOTE
Death rate is Annual per 1000 for 6 mos. period from Sept. 29, 1917 to Mar 29, 1918.

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tral section, and the South Atlantic stand first with the highest rates. Next with a rate just half that of the former group comes the West North Central. Next come the other sections, the difference between them being slight. New England is the least rural and has next to the lowest death rate. New England is represented by Camp Devens, which contains draft men. If New England were represented in this table by a larger proportion of city men, as are the other sections with their National Guard units, it is very possible that New England's death rate would be lower than it is.

The similarity in these two curves is believed to be of the greatest significance. It will be noticed that they are not parallel throughout. There are several explanations for this. In the first place, the exactness of the two sets of data is not sufficient for a complete correlation; secondly, it is felt that the disparity in the curves carries some significance. It means that factors other than sparseness of population are at work in the first two sections, causing them to run unduly high. The first two sections, which are more than twice the rate of the third, are the only ones including southern territory. There is thus brought to light a secondary broad general influence which distinguishes different sections of the country, that is, climate. It seems reasonable to explain the high position of the first two points, then, as due (1) to rural population and (2) to climate. This latter influence we shall discuss in a later paragraph

The influence of rural life on disease incidence as brought out in this table is further supported by the figures gathered from the city and rural units in the camp. Camp Cody reports that disease incidence was 48 per cent higher in the 134th Infantry than in the 133rd. The latter is made up of troops from the larger cities of Iowa. The former included troops mainly from the smaller towns of Nebraska.

Similarly disease incidence was 51 per cent greater in the 136th Infantry, made up from the smaller towns of Minnesota, than in the 135th Infantry, made up of men from the larger cities of this state.

The excess among rural troops of such diseases as measles, mumps and scarlet fever has been observed at Camp Custer and at Camp Wheeler.

Camp Wadsworth reports that their division, made up of Guardsmen from the larger cities of New York State, was practically free from disease until March, when about 1,500 draft men from the mountains of Tennessee and Kentucky were received. Their arrival had a marked effect upon the disease rate. These men soon devel-

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CHART XVIII

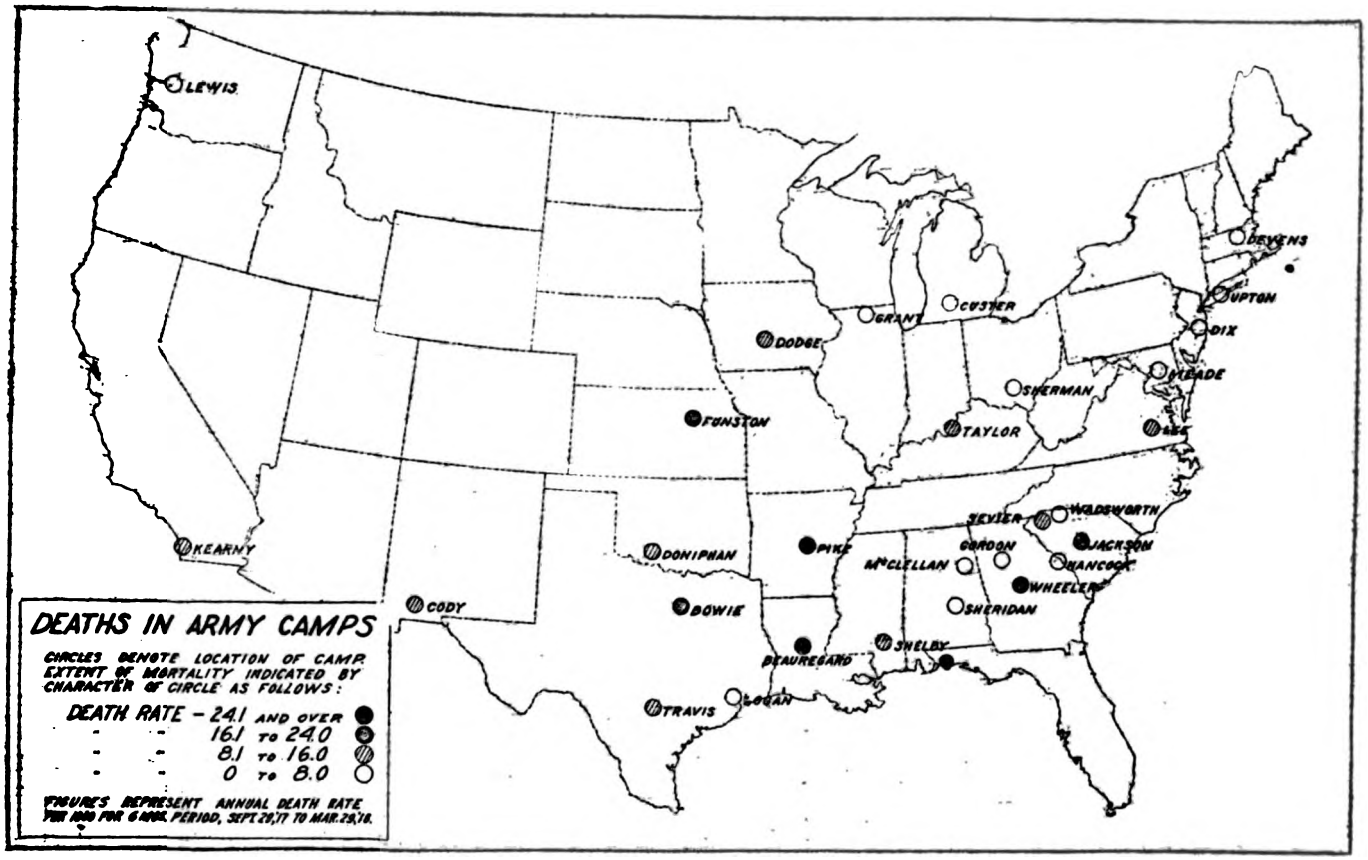

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CHART XIX

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oped meningitis, pneumonia and the minor communicable diseases. Their non-effective rate was three times that of the original division.

The epidemiologist at Camp Doniphan points out the unusually low disease incidence among city troops as compared with those from the country. The 138th Infantry and 128th Field Artillery were recruited from St. Louis, Mo. Their annual pneumonia morbidity rates from October to March were each 15. The 137th Infantry and 129th Field Artillery were from the small towns of Kansas. Their corresponding rates were 65 and 25 respectively.

(*c*) *Climatic influence.*—A climatic influence on disease incidence independent of the rural influence has already been mentioned. The relative weights of each are difficult to measure, but that they have an independent existence is quite evident. The most striking illustration of this is offered by the two maps on which are located the death rates from all causes for each camp, Charts XVIII and XIX. In the first map the circles are located at the site of the camp. It will be observed that the south is covered by circles of all shades. Logan in Texas has a death rate less than 8 per 1,000. Travis has a rate somewhat higher. Funston represents the third group of death rates ranging from 16 to 24. The highest rate shown by the black circle is represented by Pike and Beauregard. All five of these camps are subject to approximately the same climatic influence and yet their death rates are strikingly different. Looking now at the second map we read an entirely different story. In this case the circles are located in the center of the region from which the troops are recruited. The clear circles, with a single exception, have now disappeared from the south and we find all but two located in the northern states east of the Mississippi, and this section contains none but clear circles.

The exceptions are Lewis in the northwest and Gordon in the south. Gordon would seem to controvert the evidence we have presented on this score, and a great deal of speculation was raised as to why Gordon alone should exhibit characteristics different from those shown by all other southern troops. Some time elapsed before an explanation was forthcoming. Gordon, it seems, was originally set apart for troops from Georgia, Alabama, and Tennessee. About six weeks after the camp opened the above named troops were transferred to Camp Wheeler and their places were filled by men from twenty-one different states, largely drawn from the north. Gordon, thus, in having a death rate below 8, is simply exhibiting a characteristic common to the northeastern section of the country.

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Evidence showing the greater susceptibility of southern troops, and certain light on the causes, is derived from the reports of the medical officers attached to these camps.

Camp Sevier.—From 25 to 33 per cent of all cases submitted to the base hospital came from the mountains of East Tennessee and the Carolinas. Almost all cases of broncho-pneumonia were of men from this locality. A large percentage of the men from South Carolina were suffering from hookworm infection. The percentage runs as high as 35 per cent.

Tennessee, North and South Carolina have furnished the largest proportion of the troops. The troops from other states have not furnished as large a percentage of sick as the troops from the above-mentioned states, but have been the means of introducing or re-introducing some of the contagious diseases.

Camp Wadsworth.—The greatest prevalence of sickness occurred among troops from Kentucky, who "brought with them measles, mumps, meningitis, pneumonia and hookworm. These were troops of low resisting powers from the mountains of Kentucky."

Camp Wheeler.—The men at Camp Wheeler were recruited mainly from Alabama, Georgia and Florida. That the location and previous environment of the troops here were responsible for the epidemic of measles and pneumonia is attested by the report of the division surgeon. He speaks as follows about the physical condition of the men:

"1. A class of drafted men of most miserable physique is noticed by all observers.

"2. The men from the Gulf Coast could not withstand even the mild winter of Central Georgia.

"3. Many of the men suffered from the anemia of hookworm or malaria."

Camp Pike.—As to the fundamental causes underlying the epidemic at this camp, the following may be said:

"Low resistance on the part of draft troops coming from the states of Mississippi, Louisiana, Arkansas and Alabama. A study of the number of men from these sections of the country turned down by our examining board demonstrates beyond question that in the majority of instances we are dealing with a very inferior class of draft men. Company commanders have, for example, told me of the difficulty of getting their men to eat the ordinary army food. Many of them have lived for years on cornbread and side meat."

Camp Jackson.—"The enlisted personnel of this camp seemed to show an unusual amount of illiteracy, general ignorance and ignorance of personal hygiene, all of which doubtless aided in the propagation of contagious disease. An illuminating example of the state of sophistication is the fact that classes were formed and instruction given in the use of water closets and toilet paper. The enlisted personnel comes

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mainly from North and South Carolina and Florida. It is mainly rural in origin and contains a relatively large proportion of men who have not had measles or mumps in childhood.

"The physical condition of the men is not more than average, and I feel sure that there must be something in the old theory of lowered resistance and other conditions having an influence on infection. About 30 per cent of the men are found to have hookworm, while about 3 per cent are suspected of having malaria."

This evidence seems sufficient to establish the physical inferiority of the men from this region. Turning again to our morbidity and mortality statistics we find still further verification of this fact. Where there is a specific susceptibility to any disease, as may readily occur in persons of apparently good physical tone, we need not be surprised at the outbreak of an epidemic of that disease, but we do not look for high incidence in other diseases as well. The troops from the southern states possess a susceptibility that is general as well as specific. They are subject not only to the ravages of pneumonia, but also to other disease as well. Their death rate from all causes is higher and their sickness incidence is greater. This fact has already been brought out by Chart III early in this report. Here eleven indices of physical well-being have been plotted for each of the twenty-nine National Guard and National Army camps. The camps have been graded according to their relative standing in each index, and the positions of the squares have been placed in order of the death rate from all causes. The significant feature of this chart is that the camps with southern troops top the list. The blackness of the square shows that these camps are not only high in one cause of sickness but are universally high in all respects. Pike, for instance, has the highest (1) death rate from all causes, (2) death rate from diphtheria, (3) morbidity from measles, (4) morbidity from scarlet fever, (5) morbidity due to venereal disease. Wheeler is highest in deaths from tuberculosis and a close second in pneumonia morbidity. Beauregard has the highest malaria morbidity. Bowie stands first in pneumonia morbidity, Jackson first in meningitis morbidity, Travis first in hospital admission rate.

Five camps, Pike, Wheeler, Beauregard, Bowie and Jackson, have among them nine out of eleven first places in the various causes which make non-effective soldiers.

Another fact which has a direct bearing on this question is that not only is the general sickness greater among southern troops but, once sick, their chances of recovery are less. Thus in Table XXVIII are given the morbidity and mortality rates for pneumonia and

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meningitis for certain camps. The southern troops are seen to average a greater case mortality in both diseases. The Pike group has a pneumonia case mortality of 28 per cent and a meningitis case mortality of 61 per cent. These figures are nearly twice those of the Upton group, with 16 per cent and 37 per cent respectively.

TABLE XXVIII.—*Case Mortality from Pneumonia and Meningitis in Certain Camps*

Camp	Pneumonia			Meningitis		
	Morbidity rate	Mortality rate	Case mortality per cent	Morbidity rate	Mortality rate	Case mortality per cent
Pike	63	25	40	3.8	2.4	63
Bowie	96	20	21	4.7	1.6	34
Beauregard	42	15	36	12.8	7.7	60
Wheeler	95	24	25	2.4	2.1	88
Jackson	36	11	31	25.7	7.5	29
Travis	78	11	14	2.7	2.5	93
Average	.....	.....	28	.....	.....	61
Upton	15	3.6	24	0.54	0.34	63
Wadsworth	8.8	1.1	13	0.78	0.20	26
Dix	8	1.5	19	0.57	0.19	33
Logan	16	1	6	0.73	0.22	30
Hancock	6.7	1.1	16	1.8	0.44	24
Devens	9.8	2	20	0.63	0.28	44
Average	.....	.....	16	.....	.....	37

Summary of the Causes of Respiratory Diseases in Army Camps

From this extended review of the situation we feel that the greatest single factor in the prevalence of disease in certain camps and its absence in others has been the natural susceptibility of the men. Disease incidence has been markedly greater among southern troops. Southern troops are as a class more susceptible to respiratory disease. They are more susceptible because they have not had these diseases in childhood and therefore have established no immunity to them. They are more susceptible also because they have weaker physiques to begin with. This physical inferiority is due to ignorance of, and consequent failure to act upon, the fundamental laws of sanitation. In consequence those debilitating diseases such as hookworm, malaria and pellagra prevail. Venereal disease is excessive. Insufficient attention is paid to the character and

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quality of food consumed; these men have not learned that diseases are transmitted by germs, most of which gain access to the body through the mouth and nose. Spitting is promiscuous. There is no thought of stopping it even in tents and barracks. The reason for stopping it is not even appreciated.

With this condition of affairs to start with we find that there have been added those aggravating factors such as exposure, fatigue, lack of warm clothing, cold quarters by day, cold quarters and insufficient bedding by night. These men were naturally susceptible. Lessen their resistance still further, introduce the carrier case, and it is not at all difficult to anticipate the result. The fire rages among this highly inflammable timber.

The value and purpose of an epidemiological study is to discover facts that will prevent a recurrence of the trouble. Now that we have established the case, how are we to act upon it?

First and foremost it seems necessary to graduate the introduction of civilians into army life. The change has been too abrupt. Men should be called first to a semi-active reserve army. Here they should get drill and the essentials of sanitation and self-care by lecture and by demonstration. The drill and calisthenics should be the hardening process. After two months of this the transfer should be made to camp where a man's entire time is given over to his military training.

Before entering camp men should be examined for incipient disease. The suspects should be separated and watched before their dispatch to camp. Vaccination for typhoid and smallpox can be completed while in the reserve force.

Once established in camp the transfer of men from one camp to another should not take place without a careful examination and removal of those who show signs of illness. This will prevent the all too frequent transportation of sick men, who are dangerous to others because of their sickness.

These precautions, together with care in the proper mixture of work and rest, judicial selection in the quality and balancing of the food ration, the adequate protection of the man, especially the one from the warm climate, against cold and exposure, his protection against the sick through effective quarantine measures, and discretion in the use of the physical hardening process, should moderate to a large degree the experiences of the past winter.

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RESPIRATORY DISEASE AT ARMY CAMPS

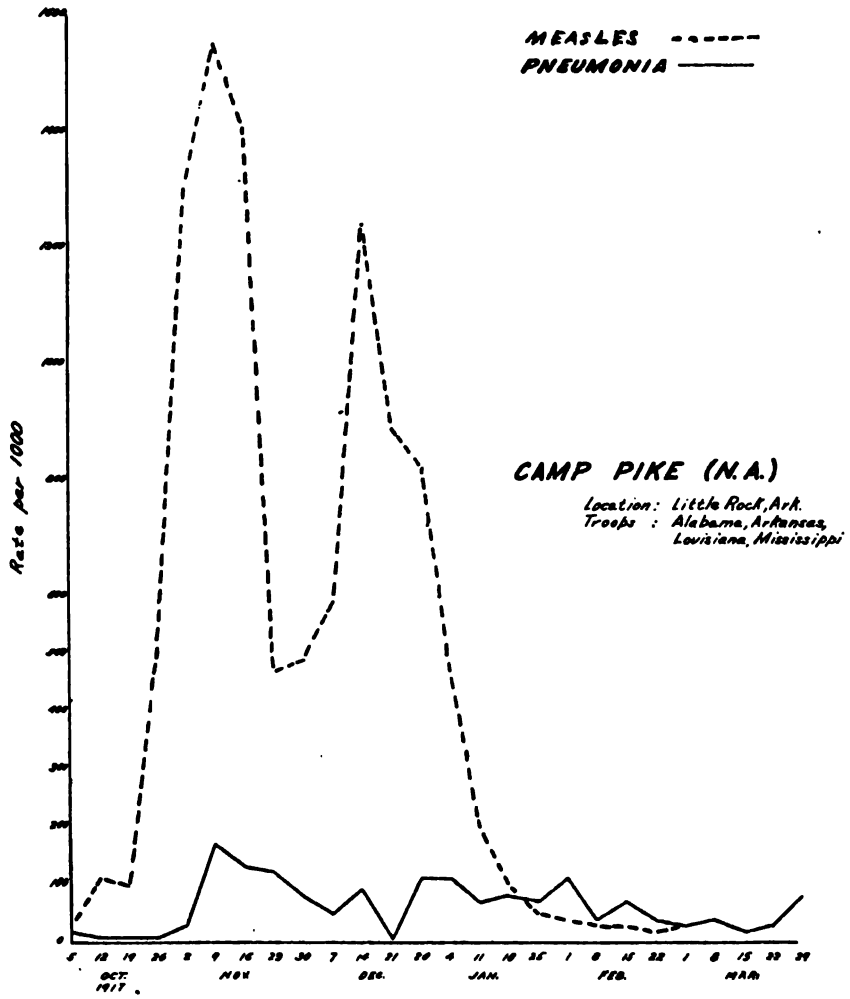

CHART XX

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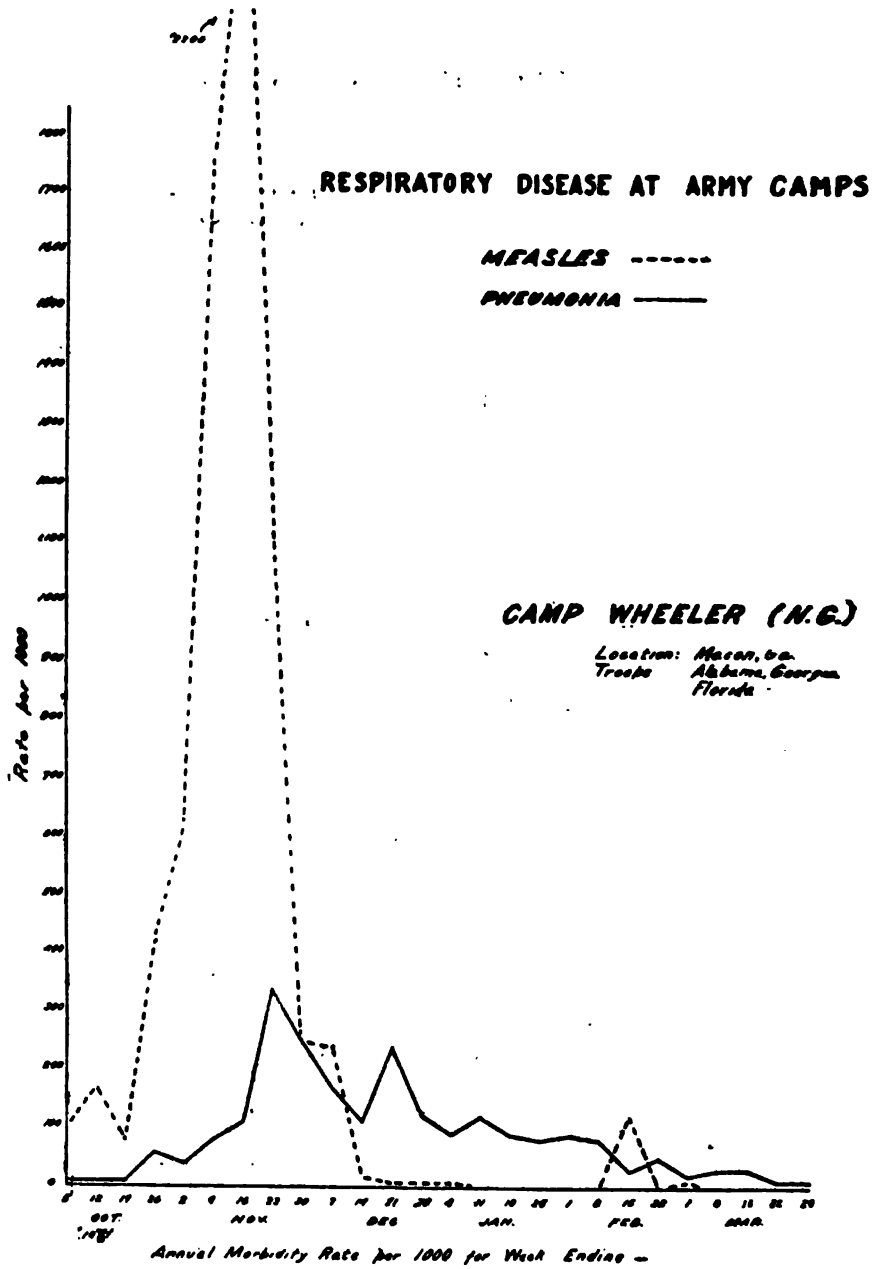

CHART XXI

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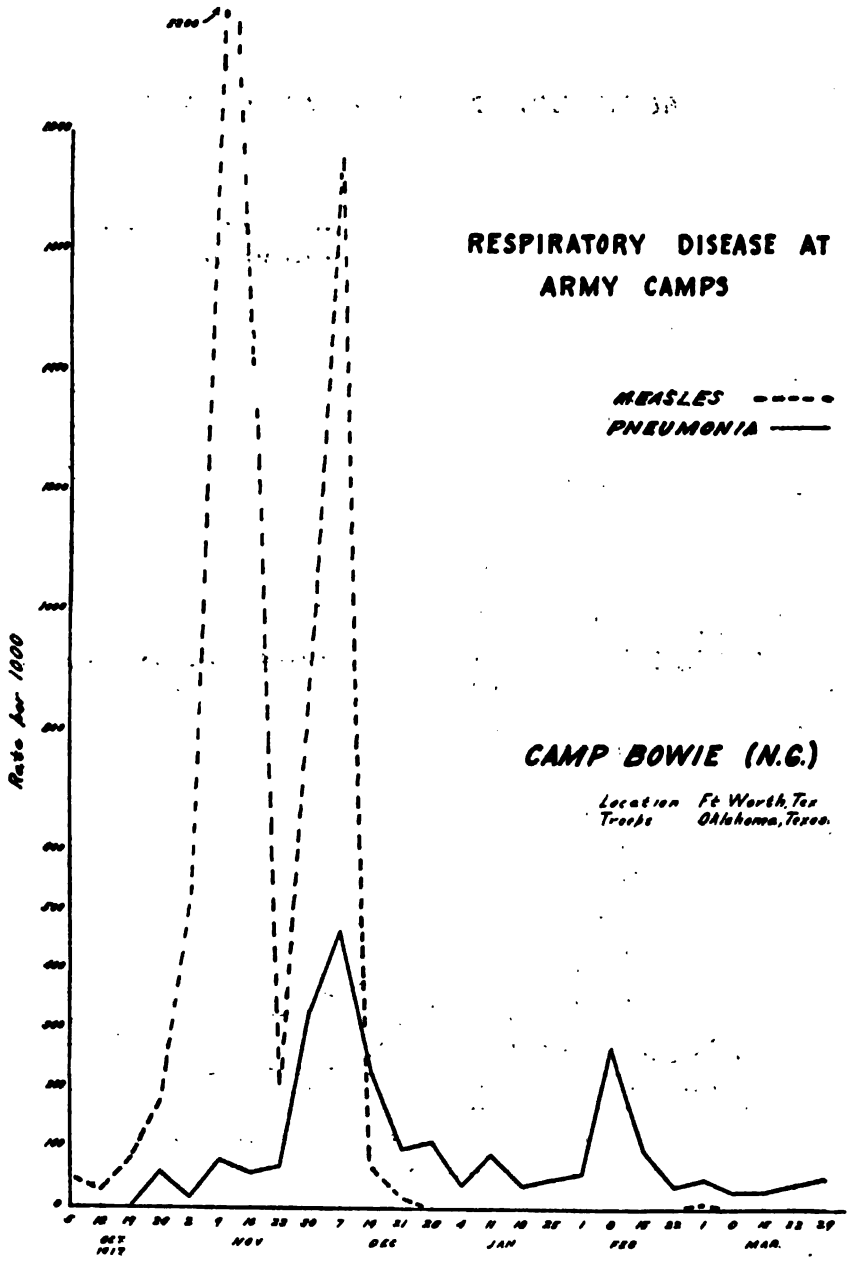

CHART XXII

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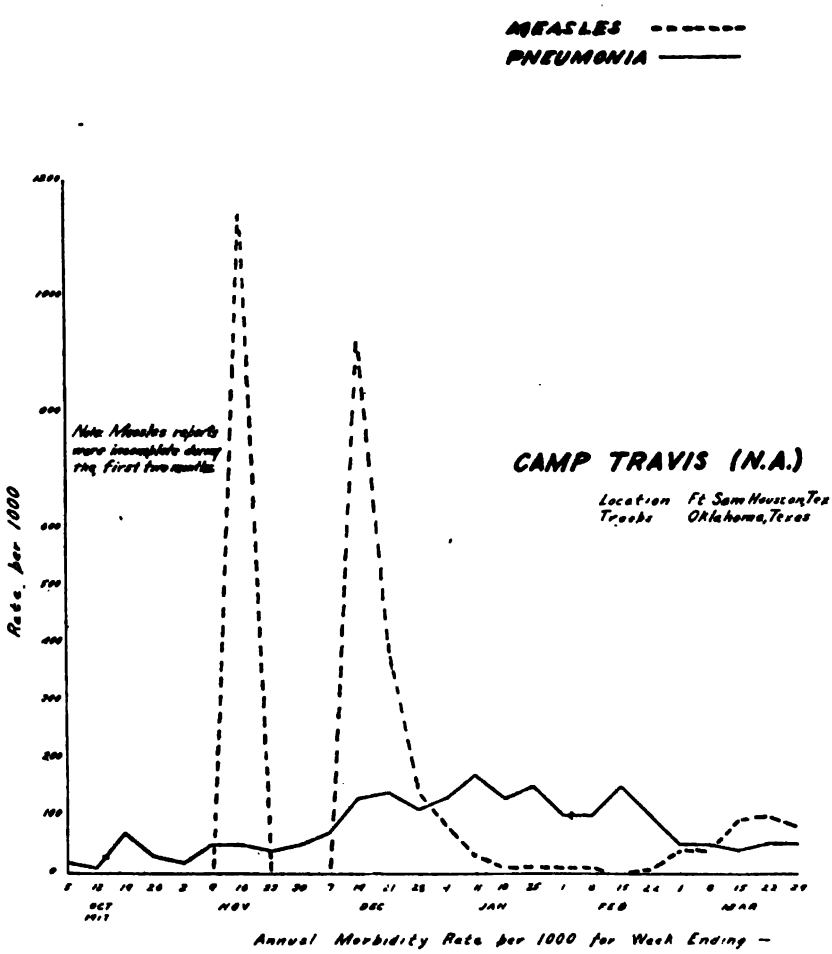

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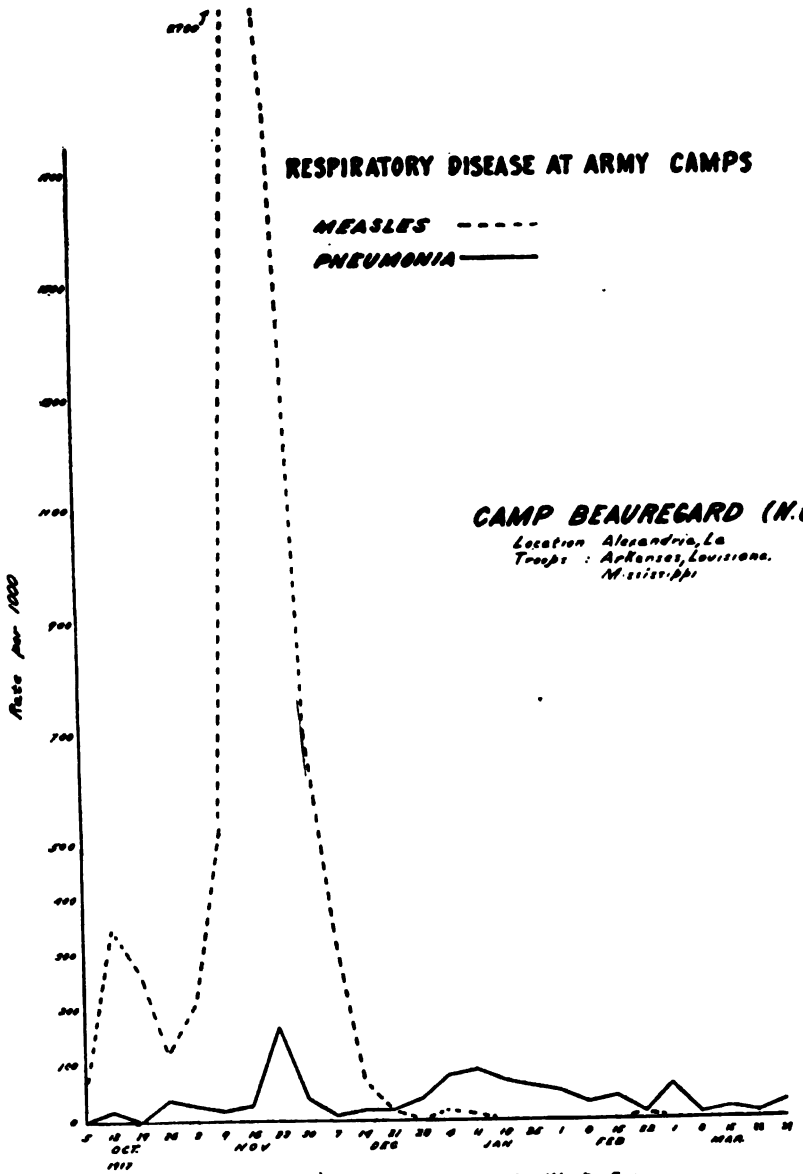

CHART XXIV

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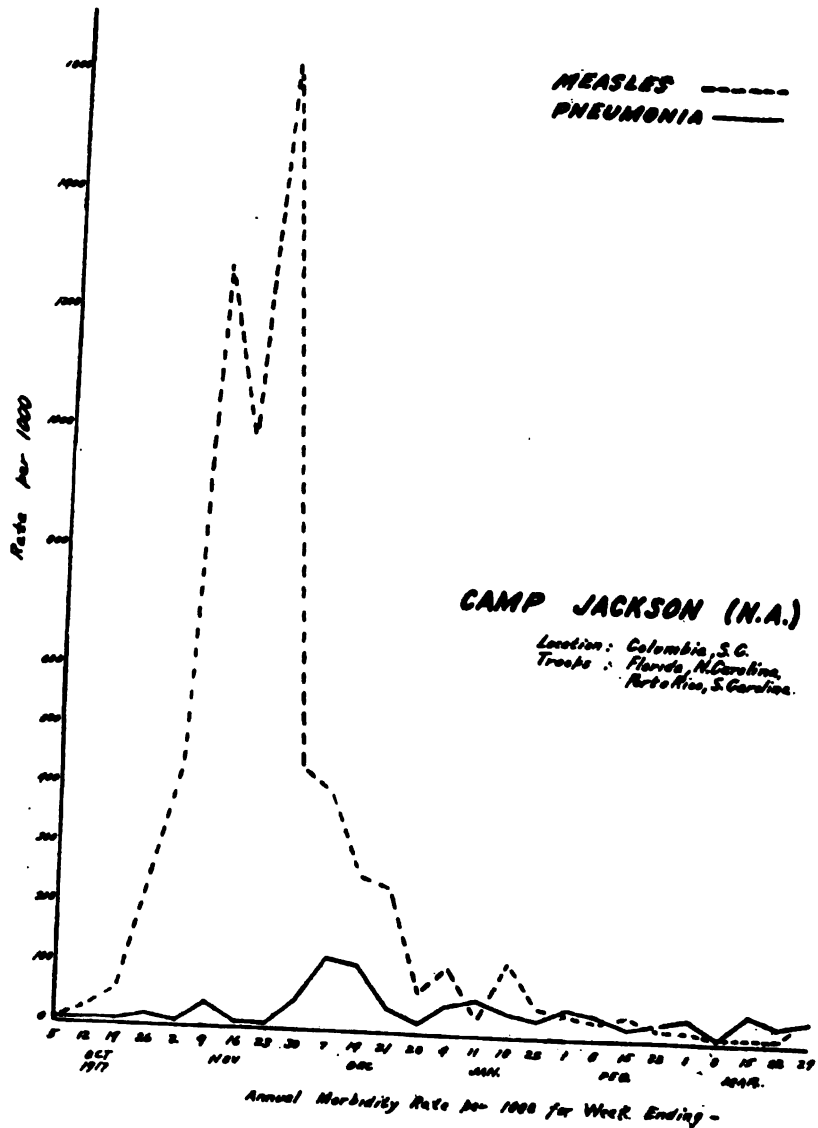

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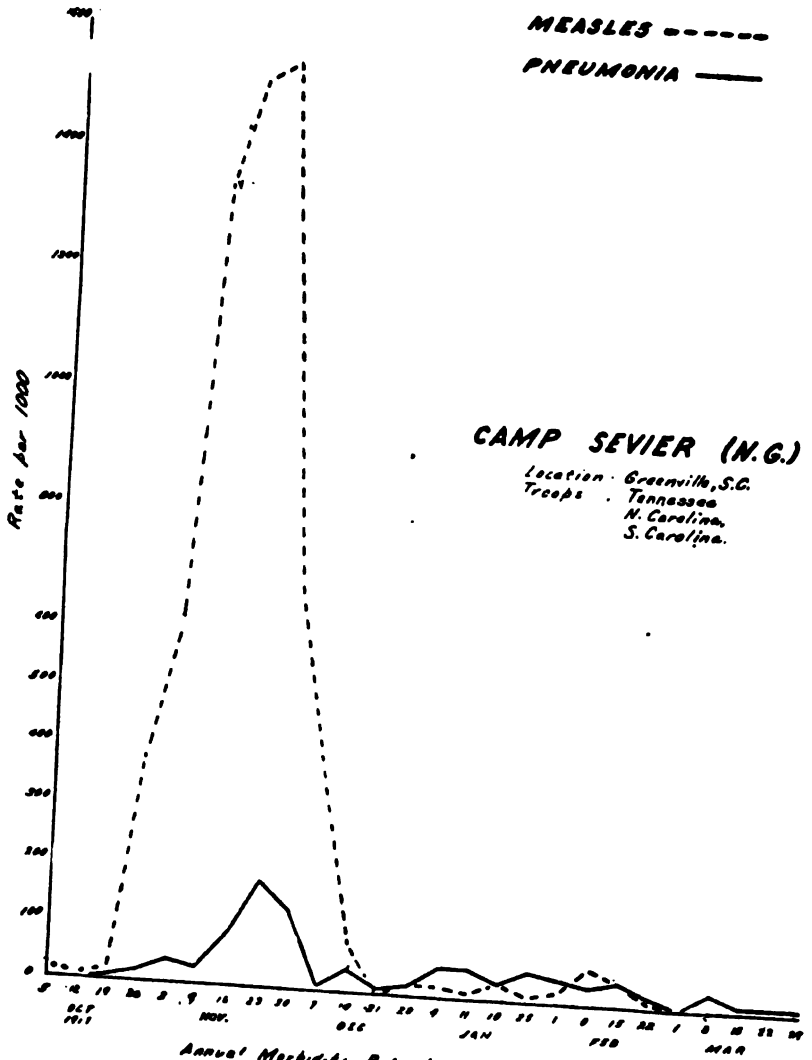

CHART XXVI

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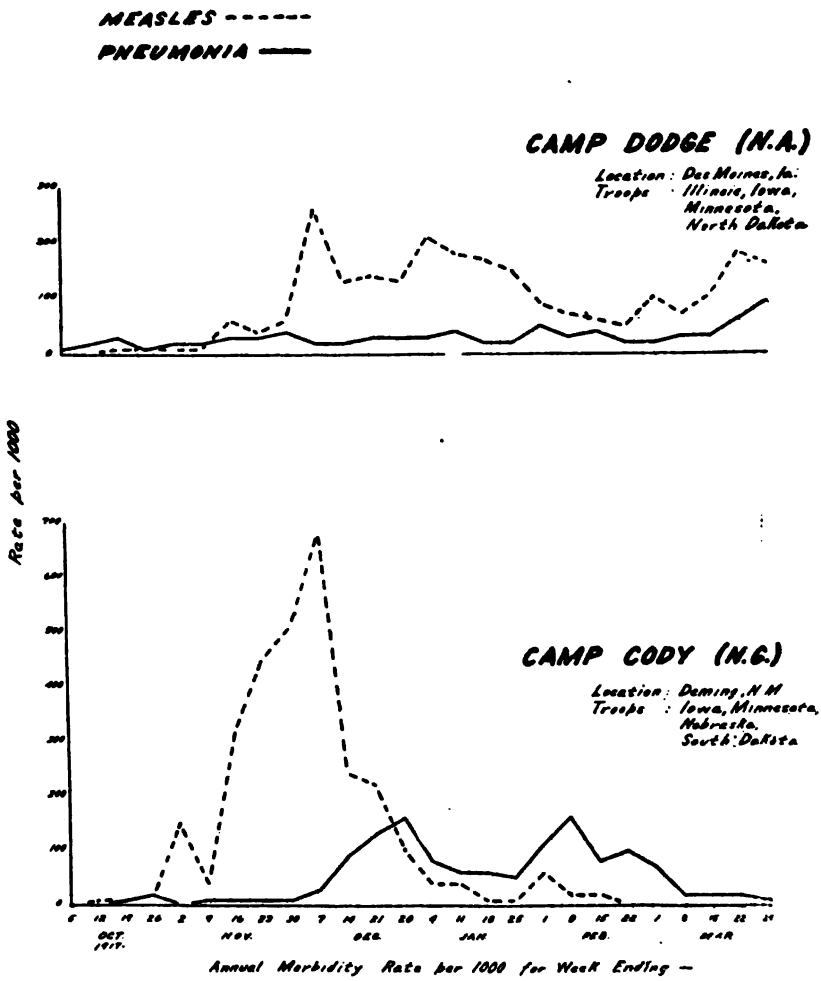

CHART XXVII

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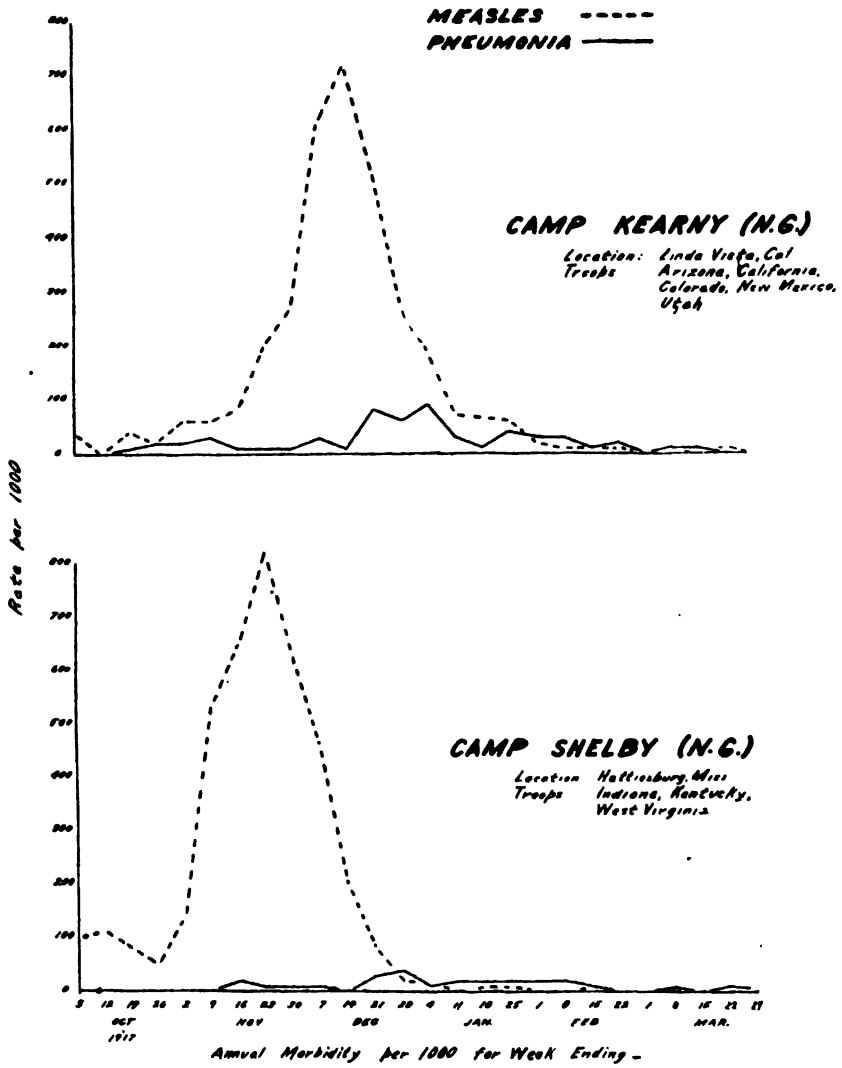

CHART XXVIII

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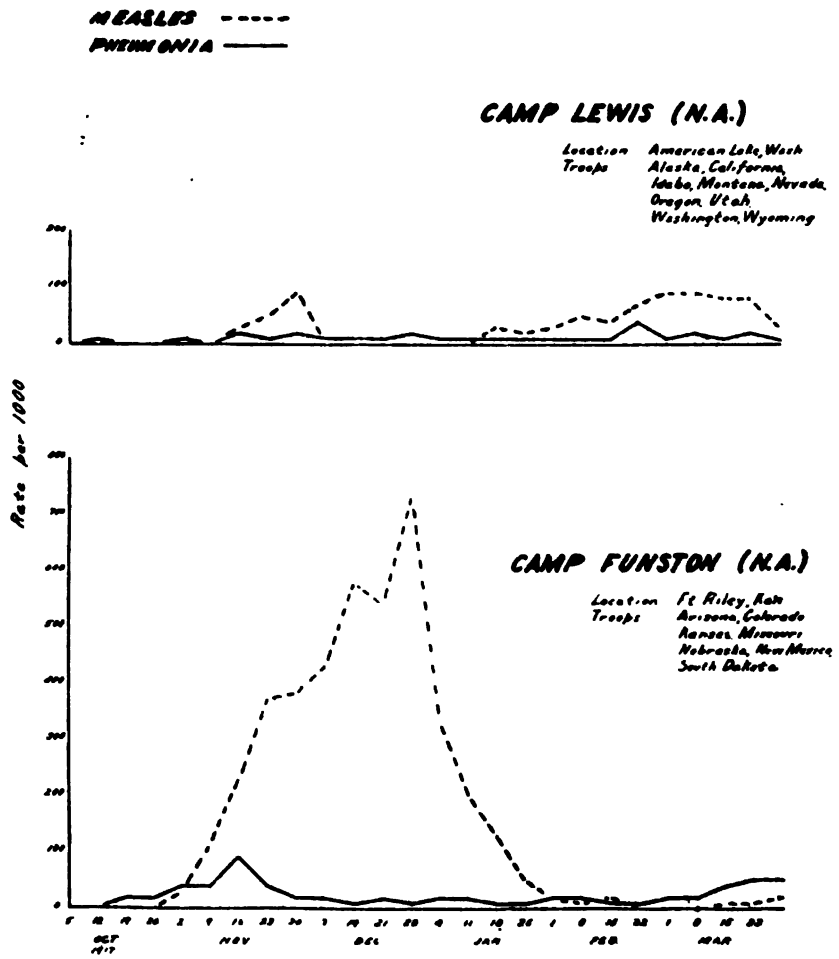

CHART XXIX

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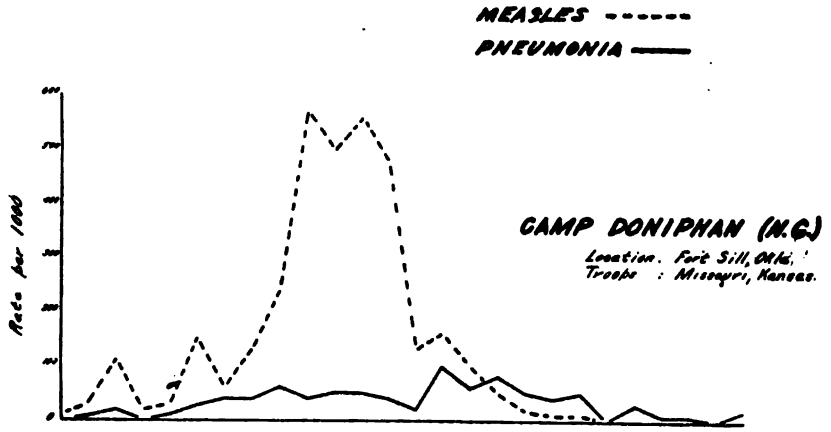
RESPIRATORY DISEASE AT ARMY CAMPS



Annual Morbidity Rate per 1000 for Week Ending —

CHART XXX

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RESPIRATORY DISEASE AT ARMY CAMPS

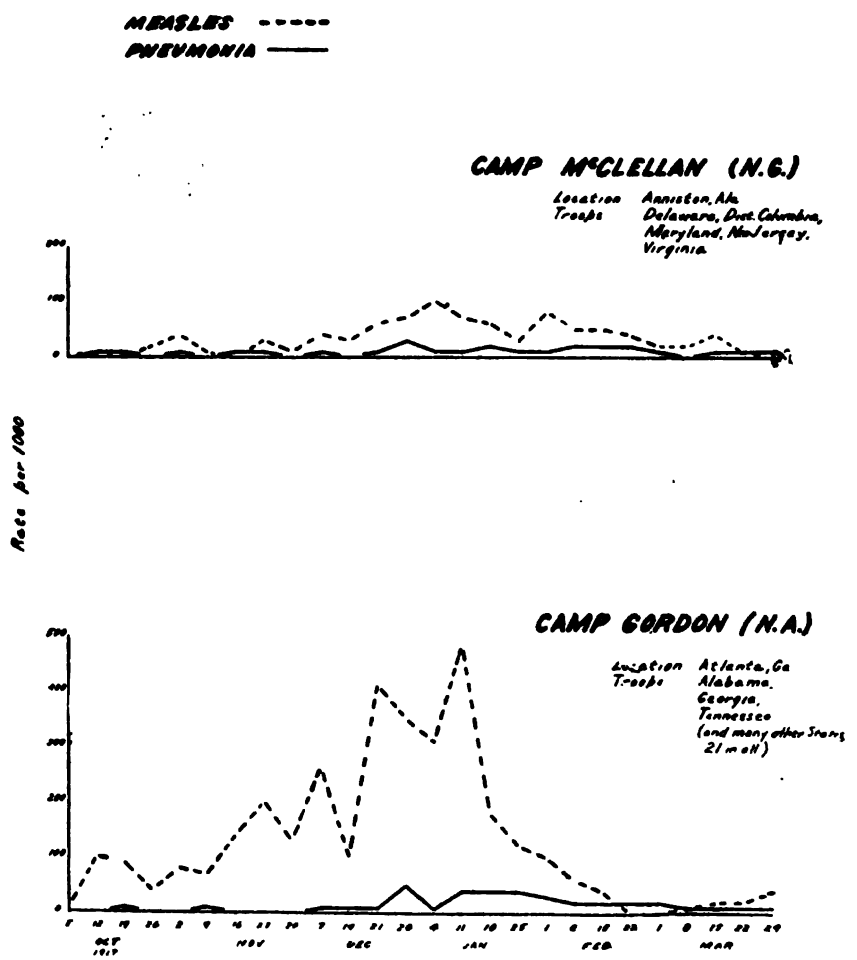

CHART XXXI

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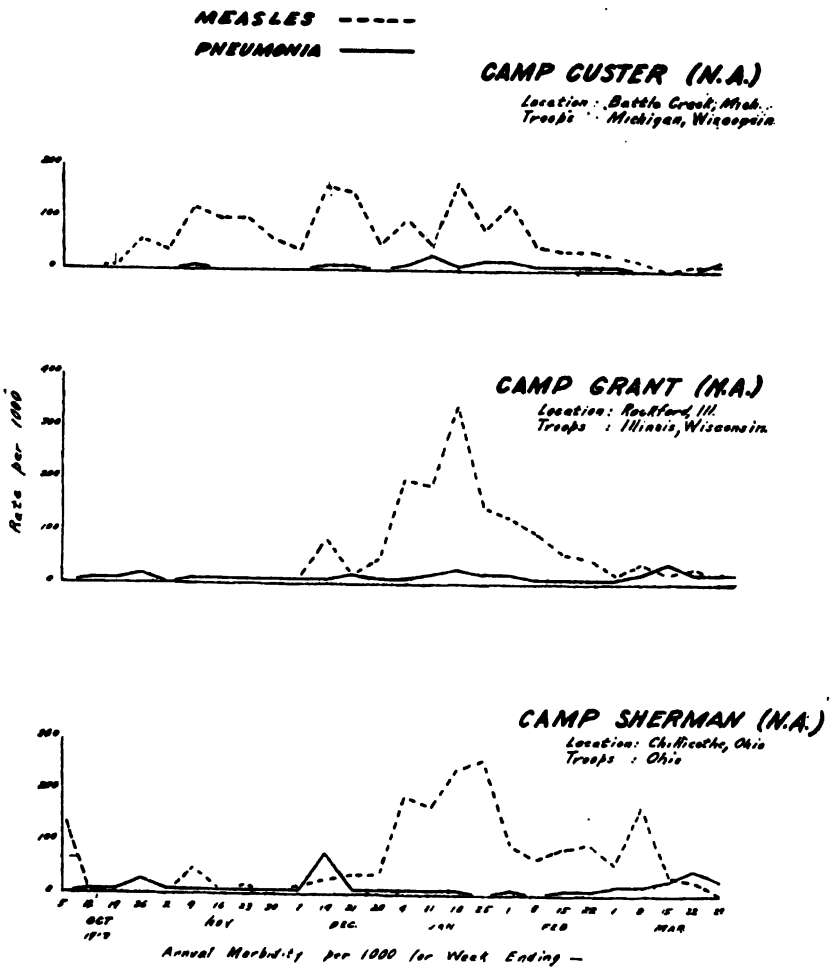

CHART XXXII

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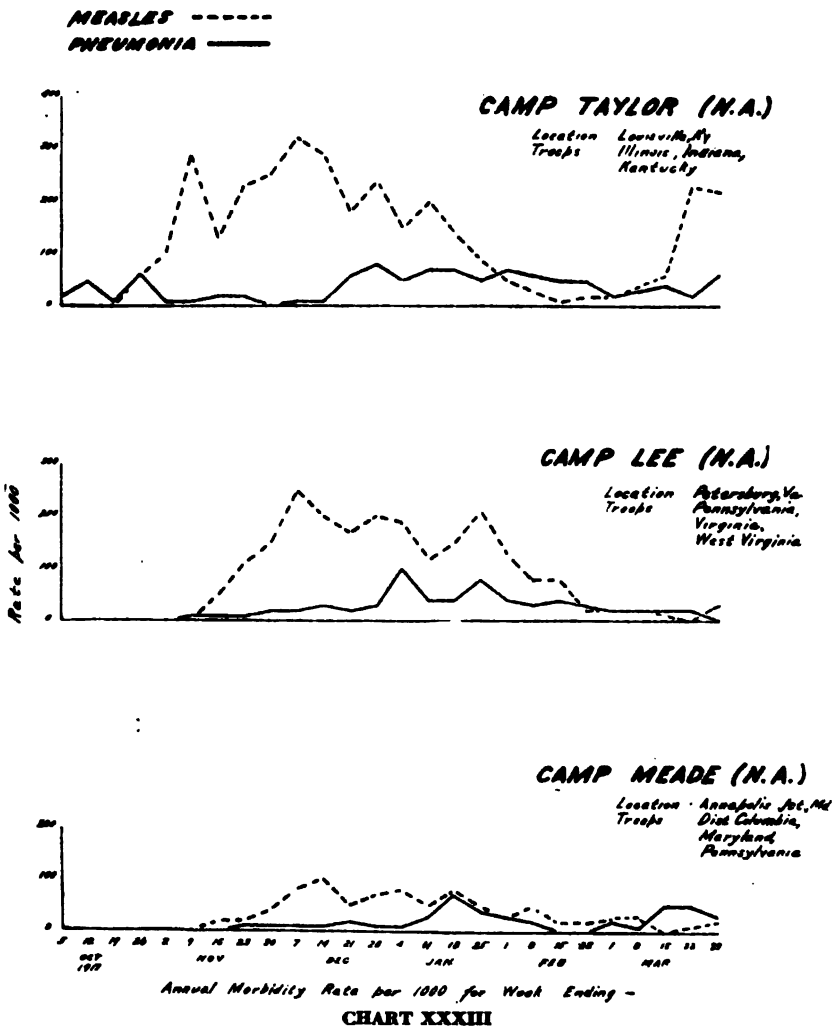

Annual Morbidity Rate per 1000 for Week Ending –

CHART XXXIII

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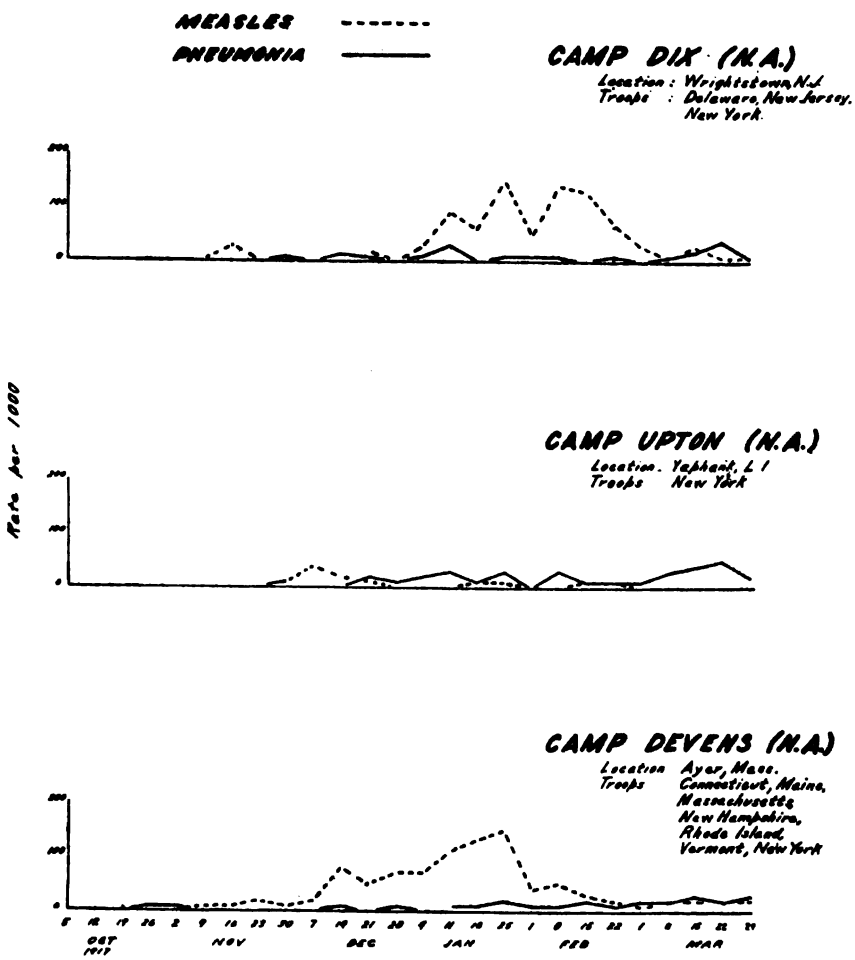
RESPIRATORY DISEASE AT ARMY CAMPS



Annual Morbidity per 1000 for Week Ending —

CHART XXXIV

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RESPIRATORY DISEASE AT ARMY CAMPS

MEASLES - - - - -
PNEUMONIA ———

CAMP SHERIDAN (N.G.)

Location: Montgomery, Ala.
Troops : Ohio.

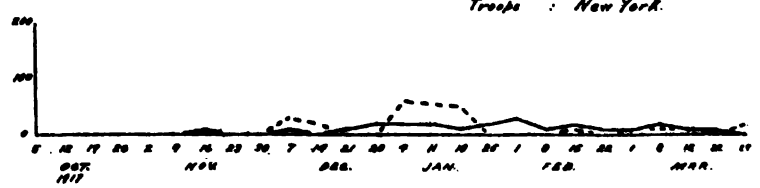
CAMP HANCOCK (N.G.)

Location Augusta, Ga.
Troops Pennsylvania.

Rate per 1000

CAMP WADSWORTH (N.G.)

Location: Spartenburg, S.C.
Troops : New York.



Annual Morbidity Rate per 1000 for Week Ending —

CHART XXXV

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A HISTORY OF THE BASE HOSPITAL, CAMP SHERMAN, CHILLICOTHE, OHIO

By Lieutenant Colonel CASEY A. WOOD, M. C., U. S. A.
Office of the Surgeon General

(Concluded from September issue)

History of the Medical Service.—The first medical wards to be occupied were in the row 9 to 16, and were divided among the various services. The first chief of the medical service was Maj. Dudley R. Roberts. To him fell the duty of organizing this department and of correlating with it the laboratory service. This duty he performed with equal skill, zeal and intelligence. His first staff consisted of the following officers: Lieutenants Sheetz, Shaffer, Freyhof, Glass, Matuska, DeVita and Hickin. The necessities of this service soon demanded increased ward space, and so additional wards were opened as fast as they were completed. The equipment for these wards was drawn from the regular medical supply depot of the hospital, except for certain articles purchased direct by Major Roberts.

Very soon it became apparent that infectious wards would have to be opened. Pneumonia cases began to come in very early, and laboratory type differentiation was instituted on October 15, 1917.

The medical service continued to grow and, on November 16, 1917, Maj. Henry L. Woodward was assigned as associate director. Shortly afterwards, December 8, 1917, Major Roberts was transferred, at his request, to United States (Columbia War) Hospital No. 1, and was succeeded by Maj. Alfred Friedlander.

By this time the medical service had grown to such a size that it was apparent that effective supervisions could only be had by an increase of the supervising force. Accordingly, Major Woodward and Lieutenant Sheetz were nominated as associate supervising officers, a system of daily rotation of wards being arranged. In this way, ward-rounds, in detail, were made by a supervising officer each day.

In January, 1918, acute infectious diseases were exceedingly prevalent in the hospital. Detailed statistics are to be found elsewhere, but it may be mentioned here that during this month nearly 650 cases of measles, 100 cases of scarlet fever, and 300 cases of mumps were admitted. In addition to these just mentioned, two pneumonia wards and eight general medical wards were occupied,

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and most of them were taxed to their full capacity. With a hospital census running from 900 to 1,100 patients, the medical service had over 800 patients all the time.

The *measles epidemic*, while of great proportions numerically, was of rather mild character. Out of the first 800 cases, only 8 had a complicatory broncho-pneumonia, with two deaths.

In the treatment of measles a strict cubicle system, by means of sheets between beds (strung on wires), had been instituted. All of the orders of the Surgeon General with reference to disinfection and sterilization of clothing, bedding, blankets, etc., were scrupulously observed. All nasal and oral secretions were caught in paper napkins, which were then deposited in paper bags fastened to the head of each bed. The bags were burned with their contents.

As routine procedures, all measles cases were examined by aural and laryngological specialists; no man was permitted to return to duty from a measles ward until a tuberculosis specialist had pronounced him free of tuberculosis, nor until his urine was albumin free.

A special ward was opened to which all cases complicated with broncho-pneumonia were sent, and from which uncomplicated measles cases were excluded.

In all of the infected wards, attending surgeons, nurses, ward masters and orderlies wore white gowns provided with caps and face masks; and in all these wards orders as to disinfection, sterilization of clothing, bedding, blankets, etc., were rigidly enforced.

Through the coöperation of the laboratory, under the able supervision of its head, Capt. (now Major) Carey P. McCord, the detection and treatment of meningococcus carriers has been systematically carried out. The comparatively small number of cases, twenty-one (with four deaths), may be explained in this manner.

The *pneumonia* cases had been segregated in two wards since the middle of December, 1917. To date there have been, approximately, 250 cases of pneumonia (lobar) in the hospital, with twenty-four deaths, including all those dying of complications. Routine typeing and urine-precipitation tests of the cases were made, antipneumonicoccus serum being given to all Type I cases.

Outbreaks of *diphtheria* in the wards were controlled by means of the Schick test of every patient where the disease was discovered, followed by immediate immunization of all reaction cases.

During January, 1917, as would have been expected, there were various composite or cross epidemics; and it was found necessary

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to open special wards for such cases. Measles-mumps, measles-scarlet and scarlet-diphtheria were the most common combinations.

The *personnel* of the medical staff has undergone many changes. New men have come and some men have been transferred. It has also been necessary to take officers from other services when the volume of work demanded it. A list of all officers in the medical service since December 9, 1917, is appended:

Majors Dudley D. Roberts, Alfred Friedlander, Henry L. Woodward; Captains M. D. Ailes, P. C. Layne, E. E. Adel, S. C. Runnels, J. J. Stanton; 1st Lieutenants J. W. Sheetz, J. A. Shaffer, W. L. Freyhof, G. F. Glass, A. Matuska, M. R. DeVita, F. W. Hickin, J. J. DeVereaux, R. M. Fulwider, H. I. Gosline, Luther Bach, C. C. Moore, E. L. Vermilion, F. McBeeler, A. M. Teixler, O. E. Welborn, L. H. Fitzgerald, H. O. Ashur, A. F. Robertson, R. C. Smisson, H. E. Babcock. In addition others were from time to time assigned to temporary duty from other services.

Without exception, all of the officers of the medical force have been of the Medical Reserve Corps.

The problems of administrative detail in a service of eight to nine hundred patients have been many and varied. These problems have not been simplified by the (at times) dearth of bed space.

Purely medical problems may be met by any physician of sufficient experience, but questions of hospital organization and administration are apt to be quite beyond the ken of the ordinary civilian physician. At Camp Sherman these questions have been solved as they arose, and solved adequately.

The *nursing force* of the base hospital, under the direction of Miss Catharine Leary, has done excellent work, and the nurses are to be commended not only for their skill but also their untiring zeal.

History of the Genito-urinary Service.—When the hospital was located in barracks A-35 the department treated a number of out-patients, members of the 3rd Ohio Infantry, on guard duty.

On September 17, 1917, the genito-urinary service, with the other services, was moved to its present location and occupied beds in ward 9, the first ward opened in the present base hospital. Up to this time Captain Barnett was the only surgeon attached to the service. Upon September 18, 1917, 1st Lieut. (now Captain) Daniel P. Ray, M. R. C., reported for duty and was assigned to this duty. Drafted men were coming in rapidly and the work soon became very heavy. As the regimental infirmaries were not yet equipped to take care of their venereal cases, it devolved upon this department

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in the base hospital, which soon had quite a large out-patient clinic, mostly cases of specific urethral inflammation. Many cases were referred to the central board for final adjudication, and of these a great many came into the genito-urinary department.

The few operations done at first in the new hospital were performed in a room off ward 9. Eventually this service was transferred to ward 12, with Lieutenant Ray as ward surgeon and Pvt. Chas. Jackson as ward master. A little later, ward 16 was opened as a syphilitic ward, with Lieutenant Ray as ward surgeon and Pvt. Ralph Mck. Brewer as ward master. The equipment in the beginning was rather crude, but substitutes for the necessary articles were supplied by the exercise of ingenuity.

At this time the department was very seriously hampered by the lack of salvarsan, so that the luetic patients were treated by the older methods.

On October 6, 1917, Captain Barnett was relieved as head of the department and Lieut. D. P. Ray assigned as acting chief. A few days later Lieut. D. W. Handley was assigned to the department, taking charge of ward 16 as ward surgeon.

Nothing of note occurred until the first week in November, 1917, when the drafted negroes of Oklahoma arrived at the cantonment. The department then had a veritable mushroom growth, so that for awhile the facilities not only of the department but of the hospital itself were taxed to take care of the large number of admissions. Most of these cases were syphilitic of all types, and as they were a menace to their fellows they had to be retained in the hospital, awaiting the healing of their various lesions. This was naturally slow because of the lack of arsenicals; however, on November 23, 1917, the first dose of arseno-benzol was given, and with that many men were returned to duty in a few days who would otherwise have been retained as patients for as many weeks. During this period the department's census included over one-half the patients in the hospital, and the service had expanded to seven wards with a capacity of about thirty-four beds each.

In December, 1917, by order of the division surgeon, the genito-urinary department was made responsible for the treatment of all cases of syphilis in the 83rd Division.

In January, 1918, owing to the great number of medical cases, a large number of patients were transferred to Convalescent Hospital No. 1 and the remainder housed in wards 25 and 26, one for the treatment of syphilis, the other for all remaining cases.

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History of the X-ray Laboratory.—This begins with September 1, 1917, at which date 1st Lieut. Samuel Brown, M. R. C., was detailed as medical officer in charge.

The laboratory building was completed about October 1, but at that time only a part of the required apparatus was available.

The importance of the X-ray laboratory was fully appreciated; five rooms were set aside for its use, namely, waiting room, examining room, X-ray operating room, transformer room and dark room. Although the building was eventually provided with the most modern and complete equipment, there were a number of needed articles designed by Lieutenant Brown and made by carpenters either among the enlisted men or from the construction force.

The *dark room* required most of this home-made equipment, since only developing trays, funnels, etc., were furnished. Realizing that the photographic phase of the work would be an important one, Lieutenant Brown set out to make, among other appliances, a large water circulating tank lined with galvanized iron, waterproof and with a capacity of 70 gallons. The tank holds a developing solution, fixing bath and space for water circulation. He also made a 14″ x 17″ printing box equipped with four 100-watt lamps and shelves for developing trays and for drying prints. There were also two plate-drying racks and a plate-loading table with shelves. Appreciating the value of lantern slides in scientific work, he devised a reducing and enlarging box.

The *transformer room* had a Waite and Bartlett transformer. The wall facing the operating room was lined with 1/16-inch sheet lead, having a lead glass window in the center. In the rear of the room there was a small but complete workshop. The advantage of being able to do repair work at a moment's notice is obvious. A rack, made from 14″ x 17″ plate boxes, served for holding unexposed plates, screens, stereoscopic plate-holders, etc.

The *X-ray operating room* was equipped with a vertical and horizontal fluoroscope, tube stand, stereoscopic plate changer, four Coolidge and four gas tubes and a trolley system. It was originally planned to use the horizontal fluoroscopic table for ordinary skiagraphic work, but its large size and immobility proved a decided disadvantage in these operations, and a table was designed more adaptable for this work. The top of the table was movable and could

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be placed in a vertical, horizontal or slanting position, as desired. Experience has proven that it can be manipulated much easier than the stereoscopic plate changer used in stereoscopic work.

The advantage of setting fractures with the aid of the fluoroscope has been well recognized, although great difficulty has been experienced by surgeons in that they were handicapped because of the lack of some mechanical contrivance ordinarily employed in surgical procedure (but not adaptable to fluoroscopic fracture setting) for immobilizing the object and producing traction. To offset this disadvantage, a simple traction board was devised which is especially adapted for the Victor horizontal fluoroscope but can easily be modified for use on any horizontal fluoroscope.

The principles involved in an effective fluoroscopic traction board are as follows: (1) The board must be made of material which can be penetrated by the X-rays, wood being the best. (2) The board must be firmly attached to the fluoroscopic table. (3) Immobilization of the limb; accomplished by aid of a padded brace provided with a strap, which is located at the upper end, and a movable foot rest padded and strapped at the lower end. The limb is firmly fastened at the hip and ankle joint with these two braces and, by means of a rope and pulley attached to the foot rest, traction is produced and continued for any length of time.

In localizing foreign bodies with the aid of the fluoroscope a simple and accurate method of calculating the distance by triangulation was devised.

An inexpensive treatment box was also made, serving the same purpose as the most modern and expensive kind.

The laboratory was opened for work upon the 24th of October, 1917, and to date there have been examined over 1,000 patients, the examinations covering every phase of X-ray work. Treatment has also been given in a number of skin diseases and tubercular glands.

The importance of focal infections of the teeth to general diseased conditions has led to experiments in developing better methods and better positions in head pictures. These efforts have been rewarded in that better dental pictures by the plate method have resulted, and these have been of special value to the dental surgeons.

Plastic printing has been developed to some extent.

The photographic department has succeeded beyond expectation. Besides doing ordinary X-ray work a large number of pathological conditions, including gunshot wounds, have been photographed. A number of lantern slides have also been made for the medical officers and used to illustrate lectures at the hospital.

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Four privates technically trained to do the work of this department have assisted the director.

History of the Clinical Laboratories.—The first group of medical officers arriving at Camp Sherman (August 28 to September 5, 1917) for the organization of a base hospital included three officers for the clinical laboratories. These were Capt. Frederick Proescher, M. R. C.; Lieut. Baxter L. Crawford, M. R. C., and Lieut. Edward B. McKinley, S. C. About this date, also, Lieut. Harold Gosline, M. R. C., reported for the same duty.

The laboratory officers, being unable to render any laboratory services on account of lack of equipment, began to get together small items of apparatus and materials from all available sources, such as their personal supplies, by borrowing from friends, drawing a few supplies from their former laboratories, and by obtaining a few items of equipment from an officers' dispensary extemporized for this period and located in Section B. The aggregate of this variously obtained equipment made possible a few rudimentary laboratory examinations. Urine examinations, blood counting, the simpler staining methods for bacteria, urethral flora examination, etc., were made. The first definite diagnosis made was that of Vincent's angina in a throat smear. A few samples of blood were drawn and forwarded to the department laboratory at Fort Leavenworth for Wassermann examinations. So meager was the equipment and so laborious was the work that Captain Proescher obtained leave to go to Pittsburgh to obtain a few of the more essential pieces of apparatus and some laboratory animals. The actual site of this laboratory work was a table in the dining-room of barracks A-35. Happily this chaotic period was short-lived.

When the hospital moved to its home, the laboratory was established in one of the small rooms of the officers' ward. In these quarters the work was sharply limited by lack of facilities that continually taxed the ingenity of the laboratory workers, the same type of work as described for the laboratory when located in A-35 being continued. In this second situation the laboratory was maintained for about three weeks.

The original plans for the construction of the base hospital allotted for laboratory purposes only two small rooms, 12′x14′, situated at the north end of Hospital Group Building No. 32, with an adjacent office, 7½′ x 12′. In this small space it was anticipated that all laboratory examinations for a hospital of 1,000 beds might be made, as well as all public health examinations for a camp of about

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35,000 persons. The insufficiency of this plan was obvious, and while the hospital was in construction the plans were so altered as to provide a separate house for the eye, ear, nose, throat, and dental work. The acquisition of this much-needed space proved very stimulating to the laboratory staff, who now set about to develop a system in keeping with the requirements of the hospital and inviting comparison with other departments. The laboratory moved into their own quarters about October 6, 1917. At this time the supplies and equipment for the laboratory began to arrive and were installed. Provision was also made for purchase in the local markets of certain emergency materials necessary in the meningitis and pneumonia work. This period marks the transition of the laboratory from a helpless, floundering inactivity into an acceptable, functioning, helpful adjunct to the various services of the hospital. This latter state may be said to have been attained about the last week in October. At this time the laboratory was not a service entity, but under the jurisdiction of the medical service.

On October 31, 1917, Captain Proescher was relieved from army duties. Lieut. Robert C. Walker, S. C., then joined the laboratory staff. This period marks another phase of the growth and development of the laboratory—a function as a public health laboratory coöperating with the Sanitary Inspector's Office in the detection and elimination of carriers of such conditions as meningitis, diphtheria, typhoid and para-typhoid fevers, and other conditions jeopardizing the health of the camp.

During November, 1917, the laboratory was in charge of Lieutenant Crawford. At this time the service was made a separate department, ranking with the medical and surgical service. Following these provisions made by the Surgeon General's Office, Capt. Carey P. McCord, M. R. C., was placed in charge. Prior to this assignment Captain McCord had been surgeon to the 343rd Infantry at Camp Grant. With the arrival of Captain McCord a reorganization of the laboratory was instituted, so as to give the laboratory greater flexibility and more exact system. This was found necessary on account of the emergency work incident to small epidemics of diphtheria, meningitis, etc. In order constantly to be in position to meet the emergency requirements made upon the laboratory, it was deemed advisable by the Surgeon General that the central laboratory be freed of as much routine ward examination as possible, and this was effected by the establishment of several ward laboratories.

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Officers' Club Room.—In December, 1917, a large room in the north wing of the receiving building was fitted up, by private expense, as a club room and library. This room was also found to be very serviceable for clinical meetings, as patients could easily be wheeled in for exhibition and examination.

Other Activities at the Base Hospital.—The recreations and amusements for the personnel were not numerous at the base hospital, nor did they ever interfere with the ordinary duties of the officials. A class in French—in which elementary conversation played the chief rôle—was conducted for commissioned officers and was carried on quite successfully by the writer of this article as leader. Occasional concerts, dances and other amateur performances were given in some of the hospital buildings, while on one occasion the officers of the hospital entertained the officers of the camp in a large dance and supper at the Y. M. C. A. auditorium.

Ophthalmic Service.—On September 1, 1917, Lieut. (now Captain) Henry Stanbery reported for duty at Camp Sherman and was the first officer assigned to the eye service of the base hospital, then temporarily located in barracks A-13, renumbered as barracks A-35. It was here that the first eye cases were examined and treated. About September 3, the examination of the first increment of recruits was begun, and, by order of the division surgeon, Lieutenant Stanbery was named as first representative of the eye service on the so-called Central Board. Maj. Casey A. Wood reported September 10, 1917, took charge of the eye service, and became chief member of that board from the eye department. These Central Board examinations were made in barracks A-33 until September 17, when all services were transferred to the present base hospital buildings, the eye service being established temporarily in that portion of officers' quarters now used for contagious diseases. The rooms assigned to the eye service at first were scantily equipped, but, with the addition of appliances and instruments brought by Maj. Casey Wood, soon boasted of trial-case, trial-frames and charts, electric ophthalmoscope, retinoscopic mirrors, Priestley Smith candle lamp, stereoscope, etc., for examination of referred recruits. During this time eye cases were scattered throughout the various wards until about October 1, 1917, when ward 10 was assigned to the eye service, where, also, out-patients were treated every morning between the hours of 10.00 and 11.00 o'clock.

On October 1, Lieut. (now Captain) J. W. Earel reported for duty, and his first task, besides assisting on the Central Board, was

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to make daily rounds of all wards, examining and treating all bedridden cases developing eye trouble. An ingenious "compartment basket" was devised by Major Wood for this purpose, in which necessary dressings and collyria were carried. During October, 1917, Maj. N. M. Black, chief of the Division of Head Surgery, Surgeon General's Office, visited the base hospital and gave the eye service a number of very valuable pointers which were much appreciated at this constructive period, and it was during the period of Major Black's visit (about the middle of October) that the Central Board, including the eye service and its equipment, was again moved to wards 19, 20 and 31, the eye, cardiovascular and tuberculosis departments occupying ward 19. During this period Lieutenant Earel was operated on for appendicitis and did not return to duty until December 8, 1917.

About this time Lieut. (now Captain) Walter D. Stevenson reported and remained with the service until transferred to the ear, nose and throat section some five or six weeks later.

Ground was broken for the head surgery house on September 28, 1917, and within ten to fifteen days it was sufficiently completed for occupancy, but, owing to lack of light and heating equipment, was really not occupied by the eye department until November 10, 1917.

On November 19, Maj. Warren E. Kershner was assigned to the eye staff, and on the day following Lieut. (now Captain) Charles A. Burkholder also joined. A few days later Major Wood, who had contracted an acute bronchitis, was given sick leave, and during his absence Major Kershner assumed the duties of chief of the eye service. November 24, Lieut. (now Captain) Albert C. Durand was assigned to the service. December 26, 1917, Major Wood was transferred to the Surgeon General's Office in Washington and Major Kershner again became chief of service, which position he held until January 18, 1918. Following his departure for Camp Sevier, Lieutenant Stanbery again became chief of the eye service and served as such until the arrival of Capt. (now Major) Ed. E. Maxey on the 29th of January. Lieutenant Burkholder was assigned to overseas duty on April 4, 1918. April 24, 1918, Capt. Robert Beattie joined the eye staff, but on May 7 received orders transferring him to Base Hospital Unit 25 (Cincinnati), to have charge of its ophthalmological department.

The work of the eye service had been greatly handicapped until very recently by the crowded condition of the entire hospital. During the winter, ward 10 was taken away from that service, being used

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for overflow of throat and ear cases, and only absolutely necessary eye operations permitted, so that practically no eye surgery was done other than ambulatory cases and those of an emergency nature. However, the number of out-patients treated was gradually increased to a daily average of sixty or more.

Ear, Nose and Throat Department.—Maj. Christian R. Holmes was assigned as chief of this department on August 15, 1917. He visited the camp August 20, 1917, but as the base hospital still existed only on paper he was not assigned to duty until September 1, 1917..

The original space set aside for the eye, ear, nose and throat department was one small room, located in what is now the Pathological Department. It was evident from the first that these accommodations would be entirely inadequate. About September 15, 1917, the plans arrived from Washington of the present splendidly planned head house. On the block plan this building was to have been located to the north of the officers' wards, but, as the county pike and a cornfield not belonging to the hospital occupied this intended site, it was necessary to change the location. Various sites were studied, but as this building was intended for ambulatory cases, not alone of patients from the various wards in the hospital but also for dispensary patients from the cantonment, it was finally decided to locate the building on the east side of the square in the center of the group. Its accessibility has since proven the wisdom of this location.

While the division of the ear, nose and throat section was admirably planned, there were many omissions of electric plugs, washstands, etc., which were necessary to make an efficient working place, as nearly all of the patients were "pus cases." These minor defects, however, were all remedied, as well as the necessary ventilation in the ceilings of the smaller rooms. The operating room originally planned had an ordinary plain wooden floor. At the request of Major Holmes to Captain Rhoades, constructing engineer, a composition floor, the same as in the surgical operating rooms, was substituted.

During the month of April, 1918, the ear, nose and throat operations numbered 249; the treatments, 4,419.

The personnel on May 12, 1918, consisted of: Maj. Christian R. Holmes, M. R. C., Chief of Section; Capt. Charles H. Weintz, M. R. C.; 1st Lieut. G. E. Murphy, M. R. C.; 1st Lieut. T. C. McCoy, M. R. C.; Capt. L. R. Effler, M. R. C.; Capt. B. G. Dyer, M. R. C.

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There was also instituted an extra-mural service. One officer is equipped, for this purpose, with a complete treatment outfit. It is his duty to visit every ward in the base hospital, outside of the regular ear, nose and throat wards, and examine every case that has the slightest suspicion of having ear, nose or throat involvement. If the patients are too sick, or unable to visit the "head" house because of having a contagious disease, then he makes minor operations upon them in the wards. Where mastoiditis develops, the chief or his assistants inspect them personally, and, when necessary, operate.

In the beginning there was a tendency on the part of the soldiers to object to operations, but this soon disappeared, and many cases suffering from chronic mastoid and sinus affections asked to be operated on that they might remain in the army.

One great drawback to this service has been lack of bed space, because of the overcrowding of the wards due to the large influx of contagious diseases and pneumonia, and it was necessary at times to crowd as many as sixty patients into a 34-bed ward.

To offset the necessarily unhealthy conditions resulting from this overcrowding it was obligatory to keep the windows open constantly and, as soon as the weather permitted, to allow a large percentage of the patients to sleep on the open porches. For lack of bed space only the urgent cases were operated on. At one time there was an operating waiting list of about one hundred, principally nasal obstructions. Many of these were candidates for aviation.

History of Neuro-psychiatric Service.—From the arrival of Capt. Henry L. Stick and Capt. John D. O'Brien, September 23, 1917, dates the opening of the neuro-psychiatric service at Camp Sherman. Captain O'Brien was detailed as surgeon in charge of ward 11 of the base hospital, devoted to the care of nervous and mental cases. Captain Stick began a preliminary survey of the entire camp alone, and referred to the base hospital such cases as appeared to need a further and more intensive examination than could be given in the preliminary survey.

On November 6, Maj. E. Stanley Abbot arrived. At this time ward 11 was given over to the medical service, and the neuro-psychiatric work was moved into new quarters, ward 36, one of the three building which were planned to house the neuro-psychiatric unit. The other two, however, have been constructed. Because of the rapid increase of the number of patients in the service, ward 36 proved inadequate for the needs of the department, and ward 32

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was opened as an overflow ward. Major Abbot, acting in the capacity of consultant to the base hospital, soon found that his time was largely occupied with this work.

Capt. Reeve Turner and Lieut. Malcolm D. Clayton arrived in camp on the 29th of March, 1918, and were detailed to assist Captain Stick in the work of the general survey of the camp. On April 1, Lieut. A. R. Timme and Lieut. C. C. Bitler appeared. About this time a method for examining recruits as they arrived in camp was adopted and the necessity for general surveys was done away with. Since this method was put into operation the attention of the entire examining force has been occupied with receiving the third increment of the first and the second draft.

The neuro-psychiatric service has grown to enormous proportions, and is now one of the most active in the hospital. To the present time, 40,000 men have been surveyed and subjected to preliminary examinations. Of this number, about 600 have been given complete examinations, and more than 400, incapacitated and unfit for service, have been eliminated.

History of the Dental Department.—During the early construction of Camp Sherman, the first dental surgeons, Lieutenants G. P. Bannister, J. C. Kemper, R. S. Harner, L. J. Deger, H. E. Albaugh, R. M. Kisner and L. W. Bentley, reported for duty, Lieutenant Bannister arriving on the 13th day of August, 1917, and the others following on various days up to August 22. These officers were quartered in Barracks E until the temporary base hospital was opened in Barracks A. They were then stationed with various organizations throughout the camp, Lieutenants Kemper, Harner and Albaugh being assigned to the base hospital. As the government equipment had not arrived, and since a portion of the first quota came in, dental services were needed, the dental outfit of the (then) 3rd Ohio National Guard, on guard duty during the construction of the camp, was taken over and used every afternoon.

On September 14, Lieut. (now Major) B. H. Sherrard reported as the division dental surgeon. He immediately telegraphed for a field equipment that was not in use at his former station, Jefferson Barracks, Mo. This arrived about the time the permanent base hospital was occupied on September 17, and was placed in what is now the officers' ward. Here dental services of all kinds were administered. About September 25 or 30 other dental surgeons reported and were quartered temporarily at the base hospital. As field outfits arrived they were stationed with various organizations of the camp, leaving Lieutenants J. D. Eby, R. M. Cope, R. M.

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Kisner, J. F. Hannon and H. E. Albaugh as the dental staff of the hospital.

Permanent quarters in the head surgery building were occupied on or about October 10, 1917. For a short time field equipment was used, but gradually the standard aseptic furniture arrived, and by November 1 the dental rooms were completely equipped with three operating rooms, a laboratory and an office, thus permitting any dental operation or prosthetic restoration.

All oral surgery and prosthetic cases were henceforth referred to the base hospital department. This service also coöperated with the various medical departments in searching out oral conditions that were foci of infection, and administered such dental treatment to the patients and personnel of the hospital as were needed.

Special Tuberculosis Service.—Capt. (now Major) S. M. Rinehart arrived at Camp Sherman September 23, 1917, and was assigned to duty September 26 as division tuberculosis specialist, attached to the base hospital.

Before September 26, men had been referred by the regimental surgeons to the Cardio-vascular Board, which had been examining patients with pulmonary as well as with cardiac diseases.

On October 3 a card index system of all examinations was begun. This has been continued ever since.

A uniform, systematic examination of all the men of the cantonment had been contemplated by the Tuberculosis Division of the Surgeon General's Office, but it was not until enough men especially drilled in such work could be found that a board, at first consisting of three members, were sent to begin such examinations. This was about November 1, 1917. The board was subsequently increased to fifteen. In the beginning a method was adopted differing in some respects from that employed in other cantonments, in that the members of the board referred all suspects to the tuberculosis specialist for diagnosis and disposition of cases, *i. e.*, whether to be recommended for discharge, kept in hospital for observation and treatment, or to be returned to their commands for duty.

This method has been employed ever since. All cases recommended for discharge are referred to the General Disability Board of the hospital, of which the tuberculosis specialist is a member. The plan has proven satisfactory, since all tuberculous and doubtful cases are retained in the hospital and the tuberculosis specialist has had charge of the ward to which such cases were assigned. By this method he has been able to avail himself of the pathological and X-ray laboratories in making a diagnosis.

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At first, one wing of the building now known as officers' quarters was given over to the examination of men by the various specialists, and there also the division surgeon signed the papers of those recommended for discharge. The officers of the Central Board were moved about October 10 to the first of the northern tier of hospital buildings, ward 10. Afterwards, about December 1, 1917, ward 22 was given over to tuberculosis patients, and in the office of this ward all suspected cases were examined.

This ward in course of time was set aside for the observation and treatment of all cases of long-continued cough, with physical signs indicating a possibility of tuberculosis. Frankly tuberculous patients not bedfast were allowed to wear their uniforms, and under proper guidance those having no increase of temperature were permitted to take short walks in the neighboring country. In fact the ambulatory treatment of chronic or semichronic lung conditions has been gradually developed in the hospital until the present time, when such men receive regular drill and work as a therapeutic (reconstruction) measure.

This work has grown greatly from the beginning, when only a small part of a ward sufficed. Now a whole building of the convalescent group is devoted to the more than sixty patients under treatment. But a small part, not one-half, of the inmates of this ward are actively tuberculous cases. More than half are really old bronchitic conditions and convalescing bronchopneumonias. It may not be superogatory to state that the tuberculous are separated from the non-tuberculous, and that a man's discharge from service and from the hospital follows closely upon the discovery of tubercle bacilli in his sputum; also that sputum examinations are made daily.

Since accurate records have been kept, or since October 3, 1917, to May 5, 1918, the tuberculosis specialist has examined 1,330 men for suspected tuberculosis. Of these, 868 were returned to duty as non-tuberculous. Six men, who had been returned to duty, have since been reëxamined and diagnosed as tuberculous. Three of the six had suffered acute diseases, such as lobar pneumonia and measles, between the time of the first and the subsequent examinations. Three hundred and forty men have been discharged for pulmonary tuberculosis, 109 men for other lung conditions of a disqualifying character, and 13 men were sent to duty under "Waiver for Special Service." Many patients were examined more than once as follows: examined twice, 120 men; examined thrice, 44 men; examined four or more times, 26 men.

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ASSOCIATION NOTES

ENTERTAINMENT OF THE ASSOCIATION OF MILITARY SURGEONS AT CAMP GREENLEAF

Plans are crystallizing rapidly for a complete program of amusement for the entertainment of our guests on October 14, 15, and 16. The meeting of the association will, without any doubt, be the greatest in its history; and it occurs to us at Camp Greenleaf that it might be of interest to show the actual operation of the morale work as it is being done in our camp.

An open-air amphitheater, large enough to accommodate all, has been provided, and the weather man has promised delightful weather for the entire month. With all this at our command, we will, on the evening of the 14th, have an open air concert with the aid of a 100-piece band and 500 trained male voices, who will sing campfire songs. Following this will be a vaudeville program, featuring as good talent as any audience in civil life ever witnessed, every effort being made to make this feature extra, only that we may show our guests the class of work being done daily at our camp.

In one group alone of this camp the attendance reaches as high as 7,000 men in one night. Still we will have ample room for reserved seats for all our guests.

On the evening of the 15th there will be wrestling and boxing, supported by the band. This feature is taken from our athletic section, and some of the contestants were former stars in the world of sports.

On one afternoon there will be a football game between the Camp Greenleaf team and some college. We are in hopes to announce that this college team will be the Vanderbilt University, noted for its football in years past and who say they will be strong this year. The medical officers long out of college can appreciate an afternoon such as this.

On another afternoon will be a grand review of the troops of this camp, and few have seen a larger body of Hospital Corps men than we will have here. Immediately following will be a trip over this camp, showing its magnitude and its daily operation. The ride will continue over the historic places of this vicinity, including Lookout

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Mountain, Missionary Ridge, and the battleground of Chickamauga. Effort will be made to explain to the officers the points of interest during this ride, that they may know what happened from a military standpoint. This should be instructive to every officer, as we use it to demonstrate what we should not do.

For those officers who care to accept such as we have to offer in the way of quarters, provisions have been made that they may remain in camp during their entire stay.

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CURRENT LITERATURE

Vaccination Antituberculeuse, by Rappin. (Note à l'Académie des Sciences, séance du 5 Mars., 1917, Comptes rendus hebdomadaires de l'Académie, tome clxiv, No. 10, p. 422), abstr. in Arch. de Méd. et de Pharm. Militaires, tome lxvii, No. 3, Mars, 1917, p. 415.

The author is said to have succeeded in obtaining a vaccine, inoffensive in itself, but sufficiently active to surely render a guinea-pig resistant against an experimentally produced tuberculosis. In several series of experiments the immunization of animals thus vaccinated was found to be complete, and was demonstrated by the inoculation of spleen, remaining without effect on other animals.

The vaccine is prepared as follows: Tubercle bacilli from bouillon cultures of different ages are subjected to desiccation for 24 hours, then treated with a 2 to 3 per cent solution of sodium fluoride (*fluorure de sodium*) during several days. In this process the bacilli lose their infectious characters, but retain their toxic properties. They are, then, after being washed in physiological salt solution, subjected, for some time, to treatment with antituberculous serum, which accomplishes their disaggregation. It is this bacillary emulsion in the serum which constitutes the vaccine.

Injected subcutaneously into guinea-pigs in doses of 3/10 to 4/10 c.c., the animals show a rise of 1° to 1.5° in temperature and one or two small local swellings, remaining indurated and constituting the points of departure for the production of antibodies. The injection of the vaccine must be repeated two or three times and at intervals of three weeks or a month, in order to realize immunization.

Basing himself on facts such as these, obtained during the last two years, the author believes that the time has arrived for trying the method in practice, especially on infants during the first few months of life and that it may prove an important factor in the prophylaxis and the struggle against tuberculosis!

H. G. Beyer.

Traitement des Raideurs Articulaires et Musculaires par la "Pondérothérapie," by M. P. Guillaumie, Médecin-traitant à l'Hôpital temporaire, No. 50, à Vichy.

While the treatment of articular and muscular stiffnesses following certain injuries to the extremities is not new to orthopedic surgeons, the general surgeon, having witnessed the painful attempts at breaking up anchylosed joints and ligamentary adhesions about these, may find some new inspiration in what the author has to say about the more

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gentle methods of treatment of these troubles by weights and which the author has called *"ponderotherapy."*

The material is the most simple and economical, consisting of five essential parts: (1) a pulley with a wheel measuring 100 mm. in diameter, hung up by a hook, below which it must be movable in all directions; it is suspended either from the ceiling or a hook in the wall. (2) A cord passing in the groove of the pulley and provided at each of its extremities with a strong musketoon. (3) Heavy sacs of muslin, cylindrical in shape, filled with sand, weighing from 1 to 10 kg., attachable by two musketoons to the upper portion of the sacs. Such sacs are called *"extension sacs."* Sacs, weighing 10 kg., of the same shape as the preceding, but unprovided with hooks and their length divided in two equal parts (5 kg. each) by a transverse suture, are called *"counter-extension sacs."* (4) A collar, made of a band of leather 5½ cm. broad and 26 cm. long, to one extremity of which are attached two rings, placed side by side, 34 cm. long. By the side of these rings, at a distance of 5 cm., an iron link, flattened to one-third of its circumference, is fixed transversely to the collar. (5) Soft cushions of wadding, covered by gauze, larger than the collar beneath which they are to be placed and of a length sufficient to completely surround the thigh above the knee.

The action of weight is exerted either directly by hooking the sacs to the collar or by the intermediary of the pulley. When the pulley is used, one of the musketoons of the cord is hooked to the ring of the collar and the other is made to support one or more sand sacs. The direction of the weight can be regulated by means of a ring (*de renovis*) in which the cord glides. This ring is attached to a cord, variable in length, fixed to the floor by a screw-ring. In this method, as will be seen, metallic weights are replaced by sand sacs, simple in form and permitting many combinations.

The adjoining illustrations show some of the practical applications of what the author terms *"ponderotherapy."*

H. G. Beyer.

On Wormholes in Tent Cloth and the Canvas of Sails, by F. Gueguen. (Jl. officiel, t. xlvi, No. 330, 13 December, 1915, p. 149). Com. to "Académie des Sciences," by Prof. Guignard, Arch. de Méd. et de Pharm. Milit., T. lxiv, No. 3, September, 1915, p. 283.

Soldiers and sailors will easily remember the curious invasion of the canvas cloth of their tents and sails by numberless black spots, appearing in such textiles after exposure to wind and weather. The damage done is very great, for the tissues thus invaded lose their resistance and tear on the least application of force. A study by the author of such spots in a very large number of specimens obtained from old sails and pieces of tent-cloth enabled him to discover the cause and to find a remedy.

These spots (*piqûrcs*) are the result of the growth of diverse moulds,

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among which the *Pleospora infectoria* (Fuck) and *Pl. herbarum* (Pers) play the dominant rôles. Alongside of these ascomycetes, generally in the conidia-stage of their development, different mucedineae are encountered (*Rhinocladium, Helminthosporium,* etc.). The filaments of these moulds and, notably, those of *Pleospora,* not only penetrate the cloth in all directions, creeping along on the surface of the tissue, entering the threads of the woof, but also cover the textile fibers and puncture the walls of them. Their mycelia thus grow within the lumen of these elementary fibers at the expense of their protoplasmic lining. A displacement of the fibers follows under the influence of ferments secreted by the mushrooms and the subsequent growth of their hyphens in the interior of the fiber.

Strange as it may seem, the invasion is never due to an accidental contamination, but the germs are already contained in the new cloth and their development occurs under the influence of heat and moisture, as an examination of many commercial specimens obtained from many different sources has demonstrated. This is the case with all the unbleached stuffs. Those that were exposed to bleaching (hypochlorites, etc.) sometimes show only accidental invasions by Penicilium or Aspergillus, which, however, do not damage the fibers of the cloth.

The brown moulds, those that cause the real damage, were introduced with the flax; they are the *Pleospora* and other mushrooms growing on the dead stems of the vegetable fibers having found their way into them during the process of maceration. Their mycelia remain in the resting stage until favored by conditions of temperature and moisture for further growth. It has also been noted that it is on the inner side of tents the development first appears and on the upper margin of the sails that are clewed up while still damp.

Sterilization by running steam or steam under pressure of the flax after maceration would seem to be the choice remedy. Chemical agents might do damage to the cloth. The process of impermeabilization of the tanks or cisterns: first, by a 20 per cent soap solution; second, by treatment with an 8 per cent copper sulphate solution, would give excellent results, providing the treatment occurred at the boiling point. Tanning also might give excellent results, a process to which sailors give the preference.

H. G. Beyer.

Le Fixol, Mode de Pansement Antiseptique très economique, by A. Mouchet and P. Loudenot. (Abstr. in Arch. de Méd. et de Pharm. Milit., t. lxvii, No. 1, January, 1917, p 97.)

Impressed by the enormous consumption of material for the dressings of war wounds in aseptic operations on soldiers, the authors began to look for a more economical mode of dressing. They believe they have found it in an agglutinative liquid which they call "fixol" (composition

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not given). This liquid they have used systematically for three months at the "Centre Hospitalier d'Epernay" (Hôpital Notre-Dame) with the "most perfect results," enabling them to realize very considerable economies.

Over all those portions of the body surface over which it is difficult to fix an ordinary dressing (head, face, neck, buttocks, etc.) it saves bandages and plasters and keeps the dressings in place better than these do, thus not interfering with the cicatrization of the wound during transport. This liquid has the power of immobilising surface bacteria when applied to the skin around the wound up to its margins, thus preventing its infection and makes a rigorous disinfection of the skin less of a necessity than is the case with other dressings.

In applying the fixol, the authors state that they avoid as much as is possible touching the wound, providing the latter is free from suppuration and membranous coverings; gentle drying, applications of silver nitrate and of tincture of iodine are done; the margins of the wound are cleaned with ether. This having been accomplished, the fixol is applied with a brush all around the wound up to its margins, the wound is covered by sterilized gauze and over this a single sheet of muslin, reaching from 3 to 4 cm. beyond the wound, is glued with a few strokes of a brush dipped into fixol. A few minutes are allowed for drying. Cotton, to cover the gauze, is rarely used and, whenever its use is thought judicious, but a small amount is employed. Such a dressing is fixed in place so firmly as to make bandages unnecessary.

To remove such a dressing all that is necessary is to detach one corner of it and peel it off. The skin underneath appears rosy, clean, dry; neither has the least irritation, erythema or redness been observed by the authors.

It is stated that this method of dressing is incomparably superior to those with the different adhesive plasters ("eucoplaste," "colloplast," zédéno"). "In the 250 cases of wounds or cases of operations, dressed by this method, cicatrization proceeded under the most perfect conditions."

The method, very decidedly, reminds the reviewer of a similar method introduced by von Oettinger long before the present war began, and very extensively employed in the beginning of it by German surgeons, and in which *"mastisol"* (solution of mastix) was used in the same sense as our authors have described for "fixol."

H. G. Beyer.

On Primary Suture of War Wounds and Their Aseptic Treatment, by Chalier. Bull. et Mém. de la Societé de Chir., tome xliii, No. 1, p. 21; abstr. in Arch. de Méd. et de Pharm. Milit., t. lxvii, No. 1, p. 107, January, 1917.

The author is a decided partisan to primary suture, after careful systematic cleansing and the thorough removal, by excision, of all the

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contused tissues destined to die. Chalier operates aseptically without employing any of the germicidal liquids, and is satisfied with the results obtained.

Opinions as to the employment of antiseptics, however, are still divided: Chalier, de Fourmestraux, and Tanton do not use them. Lemaître paints the wound with tincture of iodine and to which procedure he attributes his good results; others employ ether; Depage ether and Dakin's fluid, and all congratulate themselves upon the good results obtained. One thing seems to be certain—the purely aseptic method and the employment of any and all of the different antiseptics, providing the wound was mechanically cleansed, give identical results; that is to say, permit primary suture. This fact apparently shows that the utility of antiseptics has not yet been demonstrated, nor has it been conclusively shown that their employment endangers the healing process in a wound, as some have been pleased to assert.

There remains, however, one serious question to be taken into consideration, namely: Is it to be expected that all the operators at the front are equally skilled and thorough in the mechanical cleansing of the great variety of contaminated shell wounds they meet with, and would it, in at least a minority of such wounds, be safer to resort to the open treatment by the Carrel method with secondary suture and after proper bacteriological control? While it is perfectly true that an open wound is always in danger of secondary infection during a lengthy transport, it is equally certain that an originally infected or contaminated wound, imperfectly cleansed before primary suture, will have to be reopened, and that at a time when simple contamination has passed on to the condition of infection.

In the end, these facts considered, it must be left to the good judgment of surgeons at the front which one of the two methods of treatment it will be best to employ. There seems to be room for both!

H. G. Beyer.

On the Installation of Neuro-psychiatric Centers in Armies, by René Cruchet, Médecin-major de 2 classe. Arch. de Méd. et de Pharm. Milit., t. lxvii, No. 4, April, 1917, pp. 522–525.

The author having had some experience in installing neuro-psychiatric centers in different locations of the army zone, briefly records the results obtained, giving directions as to their organization and administration.

Considered from the point of view of *clearing stations* (*organes de triage et de filtrage*), these centers enable the specialists to separate the serious cases from the less severe cases; to send the former into the interior and to treat the latter *in loco*. His records of over 2,000 cases show that, for the "algias" ("algiques"), 92 per cent were returned to the front; for the neuropathes (commotionels, hystericals, psychas-

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thenics, etc.), 90 per cent. Out of the total number of his cases 25 per cent were hospitalized and 75 per cent returned to the front.

Installation.—From an army of 300,000 men, the author would provide for a regular admission rate of from 10 to 12 patients a day and from 150 to 200 beds as sufficient to accommodate all those remaining in the center for treatment, a number resulting from admissions and discharges.

With regard to personnel, he recommends two chiefs; one in charge of nervous cases, the other in charge of psychiatric cases, the senior for the general administration of the center.

The patients are classified as follows: (1) Those with serious mental disturbances (*Grands mentaux*); (2) those with light mental derangement, the neuropathes (*Petits mentaux*) (3) those with convulsions; (4) the algias (*algiques*); (5) the organic and feverish.

Each one of these classes of patients, requiring different treatment, the author would have us provide for conveniences of separation, recommending, for instance, 5 barracks of 30 beds each, with two or three isolation chambers, a special barrack for the *grand mentaux* divided into three sections with 10 beds each and some smaller cells; finally, an additional barrack with smaller chambers for officers, a consultation room for the chief of the service, a cabinet for electrical examinations with portable apparatuses, galvanic and faradic, serving at the same time for treatment, and a small laboratory which may be attached to the laboratory of the genito-urinary, dermatological and syphilitic center.

Administration.—(I) As a *stationary institution:* The author believes that a center, constructed as outlined above, may function equally well as a stationary center as it does as a movable one. The center is, preferably, to be located near the genito-urinary, dermatological and syphiligraphic center on account of the fact that many of these patients are syphilitic, requiring the conveniences for such examinations, especially the Wassermann test. The location of choice for both of these centers is in the neighborhood of the clearing stations (*gares regulatrices*) for the following identical reasons, given by Pasteau and Mallein, quoted by the author:

1. Clearing stations constituting, on the one hand, a sort of screen (*barrage par excellence*) and, on the other, the gate through which all the soldiers quitting or rejoining the army are made to pass, it is evident that their quick hospitalization within the station will reduce the number of the incoming and outgoing men and thus save time.

2. A considerable number of men, returning from convalescent leave, while passing through, report themselves as still sick. These being automatically returned to where they came from, their actual condition will be more quickly cleared up.

3. All such patients belonging to the transportable or sitting-up

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class, generally free from fever, their speedy evacuation from the front is assured.

II. As a *movable institution:* Whether movable or stationary, the author insists upon its location near the clearing station as being the best, a clearing station, during the movement of troops, being the most stable. The neuropsychiatric center may be mobilized within forty-eight hours and reinstalled on new ground, previously assigned to it, within the same number of hours, providing one of the physicians be detached and, in company with a few hospital-corps men, proceed to the new place for making the necessary arrangements for setting up the new center.

Our author concludes: (1) That the introduction into the army of neuro-psychiatric centers was a fortunate innovation, rendering daily the most significant services to the army. (2) That such centers should be attached to the genito-urinary, dermatological and syphilitic centers. (3) That the choice location of these centers is in the vicinity of clearing stations, not only during the stationary period but also during periods of movement.

H. G. Beyer.

Note on the Colloid Chemistry of Fehling's Sugar Test, by Martin H. Fischer, M.D., and Marian O. Hooker, M.D. (From the Eichberg Laboratory of Physiology in the University of Cincinnati.) *The Jour. of Lab. and Clin. Medicine*, Vol. iii, No. 6, March, 1918, p. 368.

It will be readily admitted by clinicians and by those physicians who have made urinalysis a routine office practice in the examination of their patients with the view of establishing a diagnosis, that "the reduction of Fehling's alkaline copper solution to cuprous oxide by sugars . . . presents variations, the nature of which is not yet fully understood." The expected bright red precipitate of copper oxide in testing the urines of diabetics for dextrose will not always appear. The precipitate, on the contrary, will vary in color from orange, yellow, greenish, etc. "The appearance of the green color, with little tendency to form a precipitate, is often regarded as entirely questionable evidence of the presence of dextrose (or other reducing material)." "The yellow precipitate is usually accepted as clear proof for the presence of a reducing body (like dextrose), but this yellow substance is not considered identical chemically with the red cuprous oxide." The authors felt *"that Fehling's reduction test, under different circumstances, does not yield chemically different copper oxides, but one and the same copper oxide in different degrees of subdivision* (possessed of different degrees of dispersion)."

"That one and the same chemical compound (as a metal, a sulphide or an oxide) may, in the colloid state, show different colors has long been known to different workers (The Svedberg: Herstellung kolloider Lösungen, Dresden, 1909)."

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It has remained, however, for Wolfgang Ostwald to recognize "that these color variations tend, on the whole, to follow a general order and that this order is coördinate with the size of the dispersed particles. The most highly dispersed particles of a given substance are likely to be yellow; as their size increases they become orange, then red, and finally violet, blue or black."

The authors have shown that *"the different colors observed in the reduction of Fehling's solution by dextrose (or other reducing substances) are nothing more than color changes coincident with a gradual increase in the size of copper oxide particles."* This paper shows that we have yet much to learn from the colloid chemist.

II. On the Colloid-Chemical Mimicry of Certain Enzymatic Reactions, by the same authors, in the same number of the *Jour. of Lab. and Clin. Medicine,* pp. 373-375.

The reactions, with the description of which this paper is concerned, seem to the reviewer of such fundamental importance to both the colloid chemist and the general biologist as to make him feel entirely justified in reproducing what the authors have to say about them in their own language:

"As is well known, formaldehyde will reduce, at room temperature, a Fehling's solution not only to the ordinary cuprous oxide, but to the metallic copper. As the copper begins to be formed it comes down in a finely divided state, in other words, in colloid form. As soon, however, as this colloid copper appears, a second reaction ensues. The metallic copper begins to act upon the formaldehyde and to decompose this with the liberation of a gas. The gas is hydrogen. When this experiment is done at ordinary room temperatures, when the Fehling's solution and the formaldehyde are first mixed (in the proportion of 10 c.c. of 40 per cent formaldehyde to 90 c.c. of Fehling's solution), nothing apparently happens; but after some hours the bright blue color becomes less transparent as a consequence of the gradual formation of the metallic copper, and, as this ensues, tiny bubbles arise throughout the fluid so that the whole mixture becomes distinctly effervescent. This process continues until all the formaldehyde has been decomposed or until all the blue color disappears and nothing is left behind but a spongy copper, from which there still rise occasional bubbles of liberated gas.

"When biologic terms are applied to the set of reactions here described, we may say that, from the mixing together of a metallic salt, an alkali and a simple carbohydrate, we observe, first, the production of an enzyme (the colloid copper). In other words, there results from mixing together a series of very simple 'dead' substances the production of that most characteristic of all the substances which characterize 'living' matter. Looked at another way, the Fehling's solution represents a reaction mixture which is 'injured,' 'poisoned' or destroyed by the formaldehyde. But against this 'poison' or 'toxin' the reaction mixture

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produces an 'antitoxin' (the reduced copper), which in its turn decomposes the formaldehyde and so retards or prevents its further injurious action upon the Fehling's solution.

"The analogy to biologic reactions is further heightened when it is pointed out that the presence of various substances will not only prevent the formation of the enzyme (the reduced copper), but will inhibit its action after formation. Potassium cyanide (which according to the classical findings of Geppert is particularly active in this regard in biological reactions, and according to the findings of Bredig, in the case of the colloid inorganic 'ferments') shows marked action upon the decomposition of Fehling's solution by formaldehyde. Whether the cyanide be added to an original mixture of Fehling's solution and formaldehyde, or whether it be added after the copper reduction and the secondary decomposition of the formaldehyde have been well established, presence of the cyanide inhibits or stops entirely further decomposition in the reaction mixture."

H. G. Beyer.

Abstracts, Translations and Reviews of Recent Literature on the Subject of the Reconstruction and Reëducation of the Disabled Soldier. War Department, Office of the Surgeon General. Eighty-four typewritten pages, illustrated.

Bulletin No. II, bearing the date of March 15, 1918, contains a most carefully selected collection of abstracts, translations and reviews on the subject, the knowledge of which it is intended to impart to those especially interested in it. Under its fourteen headings, it would seem that every phase of the sad and difficult problem of the reconstruction and the reëducation of the handicapped soldier is included and finds serious and adequate treatment. No post-bellum problem, it would seem, will require more originality, greater versatility, sounder pedagogy combined with more persevering patience and saner human sympathies than that which has been approached in the present bulletin.

The vexed question as to whether civilian or medico-military control of the disabled soldier during his rehabilitation and placement should be made to prevail is as important as its decision is difficult and fundamental at the same time. Admitting, as we must, that coöperation between medico-military men and civilians is a necessity in the problem, we may, further, admit that such coöperation, to be successful, will depend as much, if not more, on the quality and caliber of the coöperators, on the two sides, than on whether they are medico-military men or civilians. Both sides being supposedly *thoroughly* impressed and animated by the sole and exclusive desire of procuring, by all available means and methods, the greatest good to the greatest number, in the shortest possible time and in the most humane fashion, offended personal pride and the human vanities, on the one hand, ought to yield to the higher ideals in force, and military discipline, on the other, be given the func-

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tion of a simple but absolutely necessary *therapeutic* measure and be recognized as such, as controlling, for the time being, all hands, officers, civilians as well as patients, until the prime object, that of restoring the poor disabled soldier to a useful and enjoyable life, will have been attained. An impersonal, all-controlling super-humanized discipline, best administered by those whose life has been steeped in its principles and exercised in practice, would seem, to the reviewer, to offer the only probable solution of this important question. An intensive study of the contents of the bulletin could not be too highly recommended.

H. G. Beyer.

Osteo-periosteal Transplantations for the Repair of Cranial Trepanations, by Villandre (Com. à la Soc. Médico-Chir. Milit. de la xiv. Reg., séance du 28 Fev., 1917), abstr. in Arch. de Méd. et de Pharm. Milit., T. lxvii, No. 4, April, 1917, p. 563.

The author describes how he has tried to repair bony deficiencies of the skulls by cartilaginous costal transplants, by human bone plates or bones from sheep, sterilized at 130° or by calcareous plates. Osteo-periosteal transplants may be obtained either from another part of the cranium (Cazin, Mayet) or from the tibia (Delagénière), shoulder plate, trochanter, iliac tuberosity (Mauclaire). The author prefers a tibial transplant.

In comparing the results obtained with the osteo-periosteal transplants to those obtained with cartilaginous or the protheses by bone plates, one is forced to give the former the preference. With a total number of 106 transplantations, the 32 osteo-periosteal were not attended by a single failure; 48 cartilaginous resulted in 2 failures; 22 protheses with bone plates gave 4 eliminations. Thus the first method was attended by 100 per cent of successes; the second by 96.8 per cent; the third by 81.8 per cent; the last by 50 per cent. As to firmness, the osteo-periosteal transplant proved much more resistant than the cartilaginous and very much more so than the osseous plate, sterilized at 130° in the autoclave. Living bone should, therefore, be given the preference in the attempt at repairing bony deficiencies in the cranium.

H. G. Beyer.

The Painless Dressing with Greased Gauze, by Medical Inspector Dessour, Arch. de Méd. et de Pharm. Milit., T. lxvii, No. 4, p. 552, April, 1917.

The author speaks of the results of his dressings with greased gauze as most salutary. Such wounds are said to cicatrize much more rapidly than they do with other forms of dressing. The gauze, forming no adhesions, with the wound surfaces, is not only changed painlessly, but leaves no bleeding points behind, acting, at the same time, as a drain and being much preferred by the patients themselves. Healing goes on without interruption by a change of the dressings.

The composition of the mixture which has given the most satisfac-

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tory results is given as follows: Vaseline, 200 gms.; castor oil, 200 gms.; yellow wax, 100 gms. A small quantity of balsam of Peru added to it gives the mixture an agreeable odor.

For saturating and distributing the mixture in gauze, the author has had constructed a special copper vessel, lined with nickel, provided with a dripper, in which both gauze and mixture may be carried to the autoclave and sterilized; a vessel made of iron or zinc may be used for the same purpose. The ideal object in the process of impregnation to be obtained must be that of complete saturation without allowing the meshes of the gauze to be obstructed. The overflow is caught on a dripper (*égouttoir*). The sterilization may also be done in any vessel over a water bath in a solution of salines with boiling points of from 108° to 135° C.

Such dressings, according to our author, have three great advantages: they do away with pains, facilitate drainage, and expedite cicatrization.

H. G. Beyer.

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BOOK REVIEWS

TROPICAL DISEASES—A Manual of the Diseases of Warm Climates, by Sir Patrick Manson. New York: William Wood and Company, 1918.

This, the sixth edition of this popular and valuable work upon tropical diseases, has been revised by the author, Sir Patrick Manson, and, it is needless to say, has been brought up to date. The new edition is probably the most scientific and useful book upon the subject in the English language. Although the fifth edition was published only a little over three years ago, the advances have been so rapid in this branch of medicine that the present edition contains much that was not in the fifth edition and the book has increased in size to over 950 pages.

The work is divided into eight sections, as follows: Section I, Fevers; Section II, General Diseases of Undetermined Origin; Section III, Abdominal Diseases; Section IV, Infective Granulomatous Diseases; Section V, Animal Parasites and Associated Diseases; Section VI, Skin Diseases; Section VII, Ackers Poisoning; and Section VIII, Local Diseases of Uncertain Nature.

In Section I are considered all of the fevers occurring in tropical regions. The chapters upon malarial fevers are very full and accurate, but it is noted that Manson still adheres to his original description of a pigmented and unpigmented quotidian aestivo-autumnal malarial plasmodium, although there is absolutely no scientific evidence of the existence of an unpigmented malarial parasite and the reviewer, after over twenty years of wide experience in the study of the malarial fevers of both tropical and temperate regions, has failed to observe a single instance of infection with an unpigmented malarial plasmodium in the many thousands of cases of aestivo-autumnal infection which he has examined.

The chapters upon the other fevers of the tropics are full and up to date and contain the latest discoveries concerning their etiology and epidemiology. It is noted that Manson accepts the transmission of dengue by mosquitoes and that he believes that *Stegomyia calopus* has been proven to be the usual transmitter of this disease. The relationship of spirochetes to rat-bite disease is not mentioned, and the reviewer fails to understand why Rocky Mountain spotted fever should be described in a work upon diseases of the tropics, or, for that matter, why the fever peculiar to Japan, known as Japanese river fever, should be included in this book. Neither of these diseases, which bear a close resemblance to one another, occur in the tropics, as far as is known, but both do occur in the colder portions of temperate regions, one in the Rocky Mountain region and the other in the northern part of Japan.

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It is not believed that they can be considered as diseases of the tropics, and their inclusion in a work devoted to this subject appears out of place.

The chapter upon dysentery is distinctly disappointing, especially that portion dealing with endamebic dysentery, as much that has been discovered recently regarding etiology and epidemiology is not included in the discussion. The author's opinion that repeated courses of emetine generally result in permanent cure of endamebic dysentery is not supported by the experience of the vast majority of observers and is certainly not true of the infections encountered during the present war and so fully reported upon by numerous investigators, who all admit that emetine, though most valuable in relieving the acute symptoms of the disease, does not cure the infection, but that the vast majority of the cases observed become chronic carriers of the cysts of *Endameba histolytica* and suffer eventually from a relapse of the acute symptoms.

Section V, which is devoted to a description of the animal parasites encountered in the tropics and the diseases produced by them, is perhaps the most valuable section of the book. It is beautifully illustrated and the descriptions written in a style that is easily understood by even the tyro in parasitology. A careful perusal of this section shows that all the recent data regarding the life history and relation to disease of the many parasites described have been included, and the discussion of epidemiology and prevention of infection is most helpful and should result in the disappearance of many of these parasites in regions where they are now commonly found invading the human host.

The sections upon skin diseases and local diseases of unknown nature are thorough and up to date, and there is an appendix containing a short systematic description of the parasite protozoa of vertebrates and invertebrates, the classification adopted being that of Professor Minchin.

The present edition of this well-known work is a marked improvement upon previous editions and, it is needless to say, furnishes the practitioner of medicine the most recent and best work upon the subject in English. The author's long experience makes all that he says authoritative, and, while all may not agree with some of his deductions regarding etiology and epidemiology of certain diseases, the book as a whole is, in the reviewer's opinion, the best presentation of the subject published to date. It is well printed upon good paper and the illustrations are far above the average, the colored plates, especially, being accurate and beautifully executed.

CHARLES F. CRAIG.

BULLETIN No. III, April 15, 1918, War Department, Office of the Surgeon General, containing abstracts, translations and reviews of recent literature on the subject of the *"Reconstruction and Reëducation of the Disabled Soldier,"* forms a valuable addition to its two preceding

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numbers on the same subject. In its 112 pages the experiences of France and Great Britain are carefully considered in every detail and from every point of view, especially the one of their forming a possible basis of plans for the rehabilitation of handicapped soldiers and sailors in the United States in the near future.

The plan of collecting such information before our venturing into expansive preparations for meeting similar conditions as those that had to be met in France and Great Britain must appeal to the good sense of all concerned. It is absolutely necessary that we should, first of all, find out what has been done abroad, through what administrative and professional channels and agencies the objects to be attained have been approached, the difficulties, the hazards, the pitfalls, the failures, the successes that have, so far, been met with, before our own plans can be properly begun, expensive failures be avoided and clean successes be reasonably assured, especially so since it would appear from this bulletin that much is still in the air and unsettled, not having, up to date, passed the problematical or experimental phase of its development. No one can read the account given in this bulletin without being thoroughly impressed with the immensity of the problem, with the complexity of agencies entering into it, the close and intimate connections between military and civil organizations that must be brought about and put into smooth running order before we can hope for the establishment of desirable standards and principles of work in this gigantic machinery of human benevolent effort, namely, that of returning the crippled and handicapped soldier from the battlefield back to a condition of useful, enjoyable, self-respecting existence in civil life.

Although much of the information given in the bulletin is merely descriptive of what has been done in France and Great Britain, it is a necessary preliminary knowledge for a wise application of the lessons to be learned to conditions in the United States.

H. G. Beyer.

Bulletin No. IV, May 25, 1918, War Department, Office of the Surgeon General, represents a nearly complete summary of all that has been done in the past in most of the belligerent countries for the Reconstruction and the Reëducation of the Disabled Soldier and Sailor, supplemented by outlines and skeleton plans of work, projected into the near future but remaining to be perfected especially in the United States.

Consisting, as this bulletin does, of abstracts, translations and abbreviated reviews of all the available recent literature on the subject of which it treats, it does not lend itself to further abstraction. It will form a sure guide and friend to all workers in this new and barely explored field, so full of promising and fruitful results. It is fully expected that, within the next few years, American inventive genius will contribute its share in devising both new means and new methods

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for the restoration of the maimed, crippled and otherwise handicapped, to a self-respecting, independent and enjoyable life of American citizenship. There was a time when cripples were discarded, ostracized or even killed; another, more enlightened age, pitied them and cared for them; the time seems to have come and to demand that they shall be restored to a condition of health, usefulness and happiness. Dr. Samuel Howe and Miss Anna Sullivan, and what they did for Laura Bridgman and Helen Keller, for the blind, the deaf and dumb, may possibly be followed by a line of successors in new fields, in the restoration of crippled soldiers and, on similar, if not identical, principles that may result in proving their cases less miraculous than they have appeared to us up to the present time. May this fond hope be realized!

H. G. Beyer.

Radiography and Radio-Therapeutics, by Robert Knox, M.D., M.R.C.S., L.R.C.P., Consulting Radiologist, Great Northern Central Hospital, London. Part I, Radiography. Cloth. Price, $9.00. New York: The Macmillan Company, Second Edition.

The second edition of this excellent book is in two volumes, only Part I having been received at the time of this review. There is no other book that covers the subject of general roentgen technique and diagnosis in so thorough and admirable a manner as this one.

The chapters on Localization of Foreign Bodies, Radiography as an Aid to the Physician and Surgeon in War Time, Gas Gangrene, and Installations for Military Service are especially timely. Much valuable advice is given, based on the author's military experience, for the construction and operation of X-ray apparatus in both stationary and mobile units.

The text is adequately illustrated throughout.

This book so thoroughly covers the subject of X-ray diagnosis that it has been placed in the standard library unit issued to United States Army hospitals.

A. C. Christie.

Modern Urology, In Original Contributions by American Authors. Edited by Hugh Cabot, M.D., F.A.C.S., Chief of the Genito-Urinary Department of the Massachusetts General Hospital; Assistant Professor of Genito-Urinary Surgery in the Harvard Medical School, Boston, Massachusetts. Volumes I and II, illustrated with 632 engravings and 17 plates. Philadelphia and New York: Lea & Febiger, 1918. Price, $14.00.

This is a series of monographs written by specialists, each of whom is well recognized for his competency and experience. The field of urology is well covered.

Volume I begins with a chapter giving a historical sketch of genito-urinary surgery in America. We are told that "it is but ten years since genito-urinary surgery, or, as it is usually called today, "urology,"

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has become an established specialty of the medical profession of America. Before that time there were but three or four clinics in the country devoted to the care of patients having maladies of the "genito-urinary tract." The work had been done by general surgeons having a predilection for this type of surgery. It is interesting to read of the first organization of Associations of Urologists; the lists of the original members were, and a few still remain, household names in the different sections of the country represented. The writer is particularly interested in reading about Dr. Henry J. Bigelow and his work, having had the good fortune to cross the ocean with two Boston physicians, one of whom was seeking professional advice from, and at the same time being the bearer of a complimentary set of instruments from Bigelow to Billroth. Later the reviewer saw Billroth use these instruments for the first time in crushing and washing out from a bladder a large calculus, and this great surgeon expressed his appreciation of the instruments and their inventor in the most complimentary terms.

The volume is divided into four sections: Section I, the Cystoscope and its Uses; Methods of Diagnosis in Lesions of the Urinary Tract; The Roentgenology of the Urinary Tract; Syphilis of the Genito-Urinary Organs. Section II treats of the Penis and Urethra, and is a valuable part of the book, commencing with a good chapter upon the Anatomy and Anomalies and Injuries of the Penis, followed by five other chapters. Under the other sections are thoroughly considered the Diseases of the Scrotum and Testicle; The Prostate and Seminal Vesicles. Under each of the sections are five or six chapters dealing with every phase of the subjects in a thorough, authoritative and up-to-date way.

Volume II is divided into three sections: Section I, The Bladder; Section II, The Ureter; Section III, The Kidney. As in Volume I, under each section heading are a number of chapters which are all reliable monographs worthy of consultation when seeking information and advice.

In each volume there is a uniformity about the value of the chapters seldom obtained in a work of this type, and if anything of importance has been omitted in considering the broad subject of urology the reviewer has failed to note the same. There seems to have been an effort upon the part of each writer to consider first the patient in discussing the value and limitations of a proposed procedure.

JNO. E. SUMMERS.

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CLINICAL AND LABORATORY NOTES

THE WASSERMANN REACTION—A COMPARATIVE STUDY OF DIFFERENT ANTIGENS AND DIFFERENT AMOUNTS OF COMPLEMENT

By 1st Lieutenant STEPHEN H. CURTIS
Medical Corps, U. S. Army

Despite innumerable efforts to elucidate the matter of the relative value of different antigens, there still appears to be considerable difference of opinion on the subject. Possibly the number and variety of the contributions have tended to confuse rather than clarify. Most observers agree, however, that the cholesterolized alcoholic extracts are more sensitive than either the simple alcoholic antigens or the acetone insoluble lipoid preparation. It is thought by some that the addition of cholesterol renders the antigen hypersensitive and therefore apt to produce false positive reactions. This is maintained by Smith and MacNeal,[1] who state that "cholesterolized antigen is apt to yield non-specific complement fixation and therefore, in a diagnostic reaction . . . is only of doubtful significance."

The data presented herewith are based upon a study of over 5,000 complement fixation tests for syphilis, performed at the U. S. Army Department Laboratory, Southeastern Department, Atlanta, Ga., between October 1, 1917, and February 15, 1918. Four tubes were employed in each test. The first tube contained cholesterolized antigen and one unit of complement; the second, cholesterolized antigen and two units of complement; the third, acetone insoluble antigen and one unit of complement, and the fourth contained the serum control, no antigen and one unit of complement.

It was found that the acetone insoluble antigen was less sensitive in 30 per cent of the positive cases, giving a negative or doubtful result, while the cholesterolized antigen yielded a double plus. Histories obtained in these cases were positive. There were a few cases, however, in which the acetone insoluble antigen appeared to be more sensitive than the cholesterolized. Negative or weakly positive reactions occurred with the latter while the acetone insoluble antigen produced complete inhibition. It was found in the clinical records of these cases that in every instance a dose of salvarsan had

[1] Smith, J. W., Jr., and MacNeal, W. J.: Comparative Tests of Antigens. Proceedings of Soc. Serol. and Hematol., February 14, 1917.

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been administered within a few days previous to obtaining the specimen of blood to be examined.

It is a well-known fact that the serum of some syphilitic patients is capable of fixing varying amounts of complement. Some sera may fix as many as eight or ten units while others are capable of fixing but one unit, yet one case may present as positive clinical manifestations as the other. In the latter class of cases it may be readily understood how a positive might be missed in using more than one unit of complement. This has been found to be true in over 20 per cent of our cases. In some instances a doubtful (+ −) or a one plus (+) reaction was obtained with two units of complement while a double plus (+ +) was obtained, using one unit. There were many cases in which the difference in reaction was still more marked, yielding a complete hemolysis with two units of complement and a complete inhibition with one unit. These cases were checked up by positive histories. The readings are made according to the following schemes:

Positive (+ +), complete inhibition to 50 per cent hemolysis or less.

Weekly Positive (+), partial inhibition, but over 50 per cent hemolysis.

Doubtful (+ −), very slight inhibition, a few cells remaining in the bottom of the tube (on standing).

Negative (−), complete hemolysis.

TECHNIQUE OF THE TEST

The guinea-pigs are killed late in the afternoon preceding the day to be used. The blood is allowed to clot and is then placed in the ice-chest overnight and the serum separated the following morning. The complement is then diluted 1-10 for use. A 5 per cent suspension of freshly drawn and washed, human red blood cells is used. A preliminary titration of the amboceptor is made, using a standard unit of 0.1 c.c. of a 1-10 dilution and 0.1 c.c. of the 5 per cent cell suspension and varying amounts of anti-human amboceptor which has been impregnated into paper. The unit of amboceptor is determined by the smallest amount which will produce complete hemolysis in the presence of the given units of cells and complement.

This is placed in a water bath at 37° C. and allowed to remain for one hour, at which time the reading is made. We have found a great variation in the strength of complement, so advise the use of

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pooled serum of at least two pigs, and preferably more. This tends to keep the standard unit of complement more constant.

Tubes	Complement 1–10 diluted	Human cells 5 per cent suspended	Impregnated amboceptor paper	Saline 0.85 per cent
	c.c.	*c.c*	*m.m.*	*c.c.*
1	0.1	0.1	2 x 5	0.8
2	0.1	0.1	3 x 5	0.8
3	0.1	0.1	4 x 5	0.8
4	0.1	0.1	5 x 5	0.8
5	0.1	0.1	6 x 5	0.8

The method employed for the production of amboceptor is as follows:

Large male rabbits are selected. Freshly drawn and carefully washed human red corpuscles are used. They are washed until every trace of albumin has disappeared, being tested with the nitric acid test. The rabbits are injected intravenously at seven-day intervals with the following doses: (1) 5 c.c. of a 50 per cent suspension of cells; (2) 5 c.c. of a 25 per cent suspension of cells; (3) 5 c.c. of a 25 per cent suspension of cells; (4) 5 c.c. of a 25 per cent suspension of cells; (5) 5 c.c. of a 10 per cent suspension of cells.

Nine days after the last dose, a small amount of blood is withdrawn from the rabbit, the serum separated, and a preliminary titration done.

A 1 to 100 dilution of the serum is made:

Tubes	Complement 1–10 diluted	Human cells 5 per cent suspended	Amber serum 1–100 diluted	Saline 0.85 per cent
	c.c.	*c.c.*	*c.c.*	*c.c.*
1	0.1	0.1	0.1	0.7
2	0.1	0.1	0.2	0.6
3	0.1	0.1	0.3	0.5
4	0.1	0.1	0.4	0.4
5	0.1	0.1	0.5	0.3
6	0.1	0.1	0.6	0.2
7	0.1	0.1	0.7	0.1
8	0.1	0.1	0.8	0
9	0.1	0.1	0.9	0
10	0.1	0.1	1.0	0

The complement should be previously titrated with an amboceptor of known titre, to insure its strength. A complement of weak titre should not be used.

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If the amboceptor serum shows complete hemolysis in 0.2 c.c. or less, it is satisfactory for use and the rabbit should be bled to death. The blood is allowed to stand in the ice-chest over night, when the serum will be entirely separated and may be collected. Filter paper is then impregnated with serum, dried, and is ready for use.

Preparation of Antigen—Alcoholic Extract.—One hundred gms. of carefully selected beef heart muscle, free from blood, fat, etc., are macerated and placed in one liter of absolute ethyl alcohol. This is allowed to stand in the incubator at 37°C. for eight days, being vigorously shaken twice each day. At the end of this time it is filtered. One hundred c.c. of the alcoholic extract are reenforced by the addition of cholesterol, 400 mgms., making an 0.4 per cent cholesterolized alcoholic antigen.

A titration is done, using one unit of complement, 0.1 c.c. of a known positive serum, and varying amounts of a 1-10 dilution of antigen from 0.1 c.c. to 0.5 c.c. This is placed in the water bath at 37°C. for one-half hour, and then 0.1 c.c. of a 5 per cent cell suspension and 2 units of amboceptor are added and replaced in water bath for one hour. Inhibition should be complete in the first tube containing 0.1 c.c. of antigen.

An anti-complementary titration is done to determine whether the antigen is inhibitory in itself. This is carried out, as follows:

One unit complement, 0.1 c.c. of 5 per cent cell suspension, 2 units of amboceptor and varying amounts of 1-10 dilution of antigen from 0.1 c.c. to 1 c.c. It is placed in water bath for one hour. Hemolysis should be complete at 1 c.c., but the antigen may be used if hemolysis is complete up to 0.8 c.c.

The unit of antigen used is the smallest amount which will produce complete inhibition with 0.1 c.c. of known positive serum, providing eight times that amount is not anti-complementary in itself.

Preparation of Acetone Insoluble Antigen.—Evaporate one liter of the (plain) alcoholic antigen and dissolve the residue in ether, U. S. P., q. s. Then precipitate with three times its amount of acteone, C. P. Collect the precipitate, weight it, and make a 3 per cent solution of it in methyl alcohol, C. P. This is best done by taking three grams of the acetone insoluble precipitate, dissolving it in the smallest amount of ether, and adding methyl alcohol q. s. ad 100 c.c.

The setting up of the tests is done as follows:

The patient's serum is inactivated at 56° C. for half an hour. Tubes are arranged in racks four rows deep. In the first row is placed 0.1 c.c. of the patient's serum, one unit of 0.4 per cent cho-

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lesterolized antigen, two units of complement, and 0.5 c.c. of 0.85 per cent saline solution. In the second row is placed 0.1 c.c. of the patient's serum, one unit of cholesterolized antigen,one unit of complement, and saline, q.s. The same is placed in the third row except one unit of acetone insoluble antigen is used instead of the cholesterolized antigen. The last is the serum control and contains 0.1 c.c. patient's serum, one unit of complement, saline, but no antigen.

Tubes	Patient's serum, c.c.	Antigen	Complement, units	Cell suspension, c.c.	Amboceptor, units	Saline 0.85 per cent, c.c.
1.....	0.1	1 unit of 0.4 per cent chol. alcoholic.	2	0.1	2	0.5
2.....	0.1	1 unit of 0.4 per cent chol . alcoholic.	1	0.1	2	0.6
3.....	0.1	1 unit of acetone insol.	1	0.1	2	0.6
4.....	0.1	None.....	1	0.1	2	0.7

The following chart is a brief abstract of the summary of the results obtained showing the variations which occurred:

Specimen number	0.4 per cent choles. alcoholic antigen		Acetone insol. antigen	Specimen number	0.4 per cent choles. alcoholic antigen		Acetone insol. antigen
	2 units comp.	1 unit comp.	1 unit comp.		2 units comp.	1 unit comp.	1 unit comp.
2150	+	++	−	3128	++	++	−
2153	−	+−	++*	3137	−	++	−
2176	++	++	−	3220	−	−	++*
2289	+	++	−	4518	+	++	−
3074	−	++	−	4598	+−	++	−
3040	−	−	++*	4631	−	++	−
3065	+	++	−	4632	−	+	−
3069	−	++	−	4623	−	++	−
3044	−	+	−	4779	−	++	−
2921	++	++	−	4884	+	++	−

*Cases in which salvarsan had recently been administered

These are placed in the water bath for one half-hour at 37° C. At the end of that time 0.1 c.c. of a 5 per cent suspension of human

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red cells and two units of amboceptor paper are added. The tests are allowed to remain in the water bath for one hour longer, being vigorously shaken every fifteen minutes. They are then placed in the ice-chest for two hours before reading, to permit the cells to precipitate in the positive cases.

SUMMARY

In this series of cases, it has been found that the 0.4 per cent cholesterolized antigen, using one unit of complement, is by far the most sensitive test for syphilis, except in those cases in which very recent doses of salvarsan had been administered. Here it was found that the acetone insoluble antigen, with one unit of complement, was more sensitive. This holds true, however, in only a small percentage of cases, but seems worthy of consideration. The question of false positives will arise in the minds of some readers. The clinical histories in this entire series were characteristic of syphilis, so there appears to be little doubt as to the accuracy of the results obtained.

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THE
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ORIGINAL ARTICLES

Authors alone are responsible for the opinions expressed in their contributions

THE EPIDEMIOLOGY OF VIRULENT ORIENTAL SMALLPOX. A STUDY OF EIGHT CASES OF SMALLPOX OCCURRING AMONG A THOROUGHLY VACCINATED GROUP OF MEN.

BY CHARLES E. RIGGS
Captain, M. C., U. S. Navy

THE crews of the U. S. naval vessels of the Asiatic Station are frequently in contact with epidemic diseases in their most virulent forms. These epidemics have their sources and also very likely their permanent homes somewhere within the confines of the great Asiatic continent. From these original sources they spread eastward till the western border of the Pacific Ocean is reached, where the great breadth of this body of water generally serves as an effective barrier to further progress. These epidemics also sweep westward without any form of hindrance till they encounter the imperfect sanitation of eastern Europe. Consequently we are accustomed to think of our epidemics as traveling from east to west and that the East with its teeming millions and backward civilization is responsible for these visitations. Du Maurier may have had in mind the plagues of the East when he wrote of her as "The Mysterious East! The poisonous East—birthplace and home of an ill wind that blows nobody good."

During the winter of 1917-18 China suffered severely from epidemics of smallpox, diphtheria, scarlet fever and plague. As though this were not enough, each of these diseases manifested an unusual degree of virulence. At Shanghai the epidemic of smallpox was so virulent, and it destroyed so many lives among the foreign population that it became the subject of an official communication to the American Minister at Peking as shown by the following letter:

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No. 1744.

AMERICAN CONSULATE GENERAL,
SHANGHAI, CHINA, *January* 31, 1918.

Subject: Increase of Deaths among Foreigners from Smallpox at Shanghai.

THE HONORABLE PAUL S. REINSCH,
American Minister, Peking, China.

SIR:

I have the honor to report that while the number of deaths from smallpox at Shanghai among foreigners during the past twenty years ranged from 0 to 21, the total number of deaths for October, November, December, 1917, and January, 1918, aggregate 63. Every suitable precaution is being taken by the Shanghai International Municipal authorities to check the spread of the disease.

I have the honor to be, Sir,

Your obedient servant,
(Signed) THOMAS SAMMONS,
American Consul General.

The conditions as shown by this letter were, of course, unusual; but, even under normal conditions, there is by no means a small amount of danger from infectious diseases for those who reside in the Orient. As a rule, foreigners who live there make every endeavor to protect themselves from these dangerous infections but, naturally, it is impossible to fully do this. Each year they suffer a certain amount of sickness on account of the infected condition of the native inhabitants with whom they must necessarily come in contact and, for the same reason, it occasionally happens that the life of one of their number is sacrificed to a pestilent disease. They have learned to look upon this forfeiture of life as a necessary sacrifice to living conditions in the Orient. In fact, they speak of them as the "tragedies of the Orient," of which they live in continual apprehension and dread.

The remarkable aggressiveness of oriental epidemics is by no means due entirely to an absence of sanitation among these people. Their sociological relationships are probably the most important factor. The habits of living of the Asiatic are generally such as will promote the spread of any infectious disease that may obtain a foothold among them. His towns and villages are compactly built with narrow streets that are often filled with people from wall to wall. He loves the crowds such as he finds in the populous market-places, where gossiping, idleness and busy industry mingle in typical Oriental confusion. Public events, like weddings and funerals, bring all the inhabitants upon the streets to stare and gossip for the entire day. At such times epidemic diseases have an unusual opportunity to spread. It is believed that a marked accentuation during the early stage of the smallpox epidemic of 1917-

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1918 was caused by the large public funeral of one of the leading Chinese merchants, when great crowds were assembled in the streets.

The peculiar sociological relationships that obtain among Eastern people and also the practical absence of any sanitary measures in their cities are ideal epidemiological conditions for the spread of disease which cannot be equalled in any other part of the world. It is not surprising that Western people trace most of their epidemics to Eastern sources. In the Orient, smallpox, scarlet fever, diphtheria, plague, and other epidemic diseases exist the year round. The epidemics of these diseases reach their heights in waves, depending upon such natural factors as seasonal conditions and whether or not the susceptible material has been exhausted by a previous epidemic wave.

The place of contact of the present epidemic with the crews of our naval vessels was Shanghai. During the height of the epidemic the continual presence of a number of our ships at this important port was required on account of several hostile acts of Chinese bandits, or so-called revolutionists, along the upper Yangtse. This large city was full of virulent smallpox. No locality seemed to escape. One of the helpers of the Y. M. C. A., who also roomed there, was taken sick with smallpox and died in three days. More than a thousand officers and men of the Navy were exposed to this condition and, of course, all indicated precautions were taken. But, in spite of these precautions, smallpox caused more fatalities to our men than was caused by the literally thousands of bullets that were fired upon them by Chinese revolutionists up the river.

Of course all of these officers and men were believed to be as fully protected against smallpox as is possible by means of vaccination. Certainly it is unlikely that a more thoroughly vaccinated group of this number of persons could be found. The interest in the situation, then, is in the result which might be expected to follow when a most virulent type of smallpox encounters a thoroughly vaccinated group of men.

In this instance, when more than one thousand men were fully exposed to the most virulent epidemic that had visited the Chinese coast in many years, there resulted eight cases of smallpox representing five varieties of the disease. It was a conspicuous fact and, perhaps, also a significant one, that the ordinary variety of smallpox, that is, the discrete type of the disease, was not to be found in this series of eight cases. The epidemiological data are given in the following table:

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EPIDEMIOLOGICAL DATA OF EIGHT CASES, INCLUDING FIVE TYPES OF SMALLPOX

Case No.	Previous vaccination scars	Date of successful vaccination	Probable source of infection	Date of exposure to infection	Date of onset of initial symptoms	Date of appearance of eruption	Type of disease	Termination	Date
1	None.....	8-17-17	Shanghai.....	Unknown.....	8-24-17	8-28-17	Hemorrhagic.	Death.....	9-8-17
2	One.....	9-4-17	Case No. 1...	Aug. 30 and 31.	9-8-17	None	Abortive.....	Recovery	
3	None.....	11-7-15 9-9-17	Case No. 1...	Aug. 30 and 31.	9-24-17	9-28-17	Mild.....	Recovery	
4	None.....	5-11-15 9-22-17	Case No. 3...	Sept. 22 and 23	10-5-17	10-11-17	Mild.....	Recovery	
5	None.....	6-9-17	Unknown....	Unknown.....	None noted..	12-19-17	Mild.....	Recovery	
6	None.....	6-27-17	Chinese city..	2-25-18	3-9-18	3-11-18	Confluent....	Death.....	3-20-17
7	One.....	4-11-17	Unknown....	Unknown.....	4-8-18	4-8-18	Purpuric.....	Death.....	4-13-18
8	None.....	8-21-17	Unknown....	Unknown.....	4-8-18	4-9-18	Hemorrhagic.	Death.....	4-15-18

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For the purpose of controlling an epidemic of smallpox no other means than vaccination need be considered. In this epidemic the virulent infection overcame whatever immunity had been established in the individual by vaccination and resulted in one or another of the uncommon varieties of the disease. Therefore the following case histories give only: (*a*) the vaccination record as fully as was possible to obtain it, and (*b*) a sufficient number of clinical symptoms to characterize the variety of the disease.

Case No. 1—*Hemorrhagic Pustular Smallpox.*—This was the only individual among the eight cases concerning whom there was any doubt that a successful vaccination had been performed at one time or another. Upon examining his vaccination record it was found that an entry of "negative" had been made during the previous March. But the "negative" had been crossed out and "positive" written in with red ink. The gunboat to which this man was attached had no medical officer. He had the custody of his own health record and it is possible that he made a false entry of "positive" in his own record in order to avoid further vaccination. A fair-sized scar could be made out through the eruption and therefore it is likely that the entry was made in good faith, though an error may have been made in interpreting the result of the vaccination. This man was the direct source of infection of the two following cases and through one of them he caused the fourth case of the epidemic. Death occurred from the hemorrhagic variety of smallpox six days after the appearance of the eruption.

Case No. 2—*Abortive Smallpox.*—This man illustrates one of those rare and fortunate instances in which a successful vaccination was performed in the nick of time. He had been thoroughly exposed to smallpox in attendance upon the previous case before the nature of the ailment was suspected. Upon the tenth day after exposure violent initial symptoms of smallpox set in. There was a temperature of 102.8°, a "splitting" headache, several attacks of retching and vomiting and general aches and pains. The severe character of the initial symptoms would warrant an unfavorable prognosis. Vaccination had been performed on the fifth or sixth day after infection, and at the time of the onset of the initial stage it was in its fifth day of an accelerated "take." The lesion was enlarged, oval and surrounded by numerous vesicles. A comforting prognosis that the attack would be aborted was made. This was realized on the following day, when the violent symptoms abated and the disease thereafter ran the course of ordinary vaccinia. As regards previous vaccinations, there was a good scar of some years' standing and also a history of several subsequent attempts to vaccinate, some of which had been made less than one year previous.

Case No. 3—*Mild or Modified Smallpox.*—This variety of smallpox is frequently called varioloid, but this term should be relegated from the nomenclature of the disease. This man was fully exposed to smallpox when he took care of No. 1 in the sick bay of one of the ships on August 30 and 31. He did not then know that his patient had smallpox. The space in which he worked in taking care of his man was comparatively small, the period of time of exposure was nearly two days and the infection that he had charge of was a virulent variety

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of the disease. It would seem inconceivable that there were not numerous occasions when the infection was transmitted to himself. Yet the onset of his initial stage did not manifest itself till September 24, which gives an incubation period of twenty-five days. There is also another strange fact in this incubation period. He was vaccinated September 4, and his vaccination was pronounced a "take" September 9. Thus the important dates are: intimately exposed, August 30 and 31; vaccinated, September 4; pronounced successful, September 9; appearance of the initial stage, September 24. If the conventional period of incubation of fourteen days is adopted in this instance, then the man was infected September 10, or one day after his vaccination had been pronounced as successful. It is remarkable if he escaped the definite and intimate exposure in the close quarter of the sick bay and then ten days later picked up an infection in an unknown manner immediately after manifesting a successful vaccination. The other alternative is that this attack of smallpox had a period of incubation of not less than twenty-five days.

Case No. 4—Mild or Modified Smallpox.—This man and No. 3 had formerly been friends. When he arrived at Shanghai from up the Yangste River, on September 22, the friendship was resumed and they visited each other daily till No. 3 was isolated. The initial stage was sufficiently marked, the temperature rising to 103°. However, the eruptive stage was slow in developing and the eruption persisted as hard, red papules, only one of which became pustular. The vaccination history was excellent. The record showed that a successful vaccination had been performed in May, 1915, and another September 22, 1917, or about the time he received his infection. These vaccination entries were confirmed by two well-pitted scars found upon examination after recovery. Ordinarily, a successful vaccination performed in the first day of the incubation prevents smallpox, though there may be fever.[1]

Case No. 5—Mild or Modified Smallpox.—This man contracted his disease from an unknown source while attached to one of the gunboats at Shanghai. The initial stage passed unnoticed, but the eruptive stage was well marked, developed rapidly, and the body was soon covered with maturated pustules. His vaccination history was excellent. He was vaccinated June 9, 1917, and had a severe reaction. The scar was still inflamed when he reported on board September 1. However, he was vaccinated again with a negative result. In reporting the case his medical officer stated: "The members of the crew were vaccinated December 4 with the exception of this man. He had an eruption on his forearm, so when he came up to be vaccinated I told him he had better wait as I considered him protected. Unfortunately, this was not entirely correct. This man is the type of person who seems to catch everything. He had had measles and mumps in the six months during which he had been in the service."

Case No. 6—Confluent Smallpox.—This man was attached to a ship that stopped at Shanghai while en route to a more northern port. When ashore February 25, 1918, he visited the "Chinese City" on a sight-seeing trip. He did not go into any of the buildings, but amused himself by walking through the narrow streets and watching the crowds. As there was no other likely source of

[1] "Modern Medicine," Osler and McCrae, 2d Edition. Vol. i, p. 844.

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infection this is probably an actual instance of the conventional method of acquiring an infection. The vaccination history was poor. There was a record of his having been successfully vaccinated in March, 1917. The scar was sufficiently large, though not satisfactorily pitted. He claimed to be able to recall seven occasions upon which he had been vaccinated, but could remember no "takes." The immunity established by the successful vaccination of 1917 may have been sufficient to protect against further vaccinations, but not sufficient to protect against a virulent type of smallpox.

Case No. 7—Purpuric Smallpox.—This is the most atypical and fatal form of the disease. It is a variety of smallpox that is not often seen even in the Orient. It is said to attack more frequently young and robust individuals and the majority of cases occur in vaccinated persons.[1]

The unfortunate victim of this attack was a healthy young man who was apparently well protected against the disease. He had been successfully vaccinated and he also gave a history of having had smallpox as a child. This man reported sick on the morning of April 8, 1918, complaining of severe pains in the head, back and abdomen. There was marked vomiting, and temperature 100.8°, pulse 102, respiration 28. By evening a rash resembling that of measles appeared on the abdomen. The conjunctivae were injected, and the tongue and mucous membrane of the mouth presented a whitish covering. The next day the temperature reached 104°, and the vomiting and severe pains in the head and back continued, but the abdominal pain had disappeared. By April 10, the third day of the disease, the infection had reached its full force. The rash had extended to the arms and legs, but the skin of the face and neck was still free from eruption. Instead of erupting, the skin of these parts was thickened and assumed a sort of plum color which extended down upon the shoulders. This phenomenon—that is, the thickening of the skin with its remarkable coloring—was the most striking symptom observed during the course of the disease, and when once seen it will not be forgotten. There was constant cough as though from congestion of the respiratory tract. The expectoration was streaked with bright-red blood and there was some bleeding from the throat, nose and gums. Extreme restlessness accompanied these violent symptoms, and the general appearance was that of a man in the grasp of a powerful infection against the progress of which it seemed impossible to accomplish anything. Death took place April 13, or five days from the onset.

Prior to the attack this man was considered protected against smallpox. He gave a reliable history of having had an attack of the disease when five years of age. There was a record of a successful vaccination that was just one year old at the time of the attack. There was a pitted scar on the right arm and a non-pitted one on the left.

Case No. 8—Hemorrhagic Pustular Smallpox.—This last case of the epidemic reported sick the same morning as the previous case of purpuric smallpox. He also had a violent attack, and the disease ran its fatal course almost as rapidly as did the purpuric case. The fact that they were taken sick at the same time with forms of the disease resembling each other in severity suggests that they

[1] "System of Medicine," Allbutt and Rolleston, Vol. ii part I, p. 507.

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had identical sources of infection. This man was violently delirious throughout the attack. On one occasion he escaped into the compound by breaking through the window of his ward. The eruption began on the second day in the customary places, that is, the forehead and wrists. It rapidly covered the entire body, sparing neither the palms nor the soles. Death occurred April 15, seven days after the onset and six days after the appearance of the eruption.

The vaccination history was good. There was a record of a successful vaccination in August, 1917, and there was a well-pitted scar.

ABSENCE OF THE DISCRETE VARIETY OF SMALLPOX

It is remarkable that in this series of eight cases of smallpox there were as many as five varieties of the disease represented. Also, the discrete variety, the type that is ordinarily met with, was conspicuously absent. The five varieties that were present in this epidemic were modified, abortive, confluent, pustular hemorrhagic and purpuric smallpox. Four of the eight cases of the epidemic were very mild and soon terminated in recovery without complications. With the remaining four, the infection took on violent forms and ran rapidly fatal courses.

During the period of this epidemic, more than one thousand men were exposed to infection. This gives a morbidity rate of considerably less than one per cent in a group of men believed to be thoroughly vaccinated. The situation was that of a thoroughly vaccinated group of men in contact with a virulent form of smallpox infection. The result was four very mild infections and four very severe ones. In other words, the extreme types of smallpox were present and the intermediate varieties were left out. This would indicate, then, that the usual, medium variety of infection, the discrete variety of smallpox, can find no place when the contest is between the most virulent form of the disease and a thoroughly vaccinated community.

PERIODS OF INCUBATION

The length of the period of incubation of a disease is always of importance to the epidemiologist. It is a factor that must necessarily enter into calculations concerning probable sources of infection. Cases Nos. 2, 3, and 6 had the conventional periods of incubation. No. 3 had an incubation period of twenty-five days, but the circumstances were exceptional. Instances are not often observed in which a vaccination has been made and has run its entire course doing the period of incubation.

In vaccination it is not the dying out of the parasite that causes recovery from the symptoms. The vaccine virus may remain in an active state within the body for three or four weeks after its introduction, or, in other words, after vaccination has been performed.[3] That is,

[3] Dock in Osler's "Modern Medicine," 1st Edition, Vol. ii, p. 315.

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vaccination having been performed September 4, their germs would be expected to become inactive about September 24. In this instance of delayed development of the disease, or an exceptionally long period of incubation, the probable time of the disappearance of the vaccine germs from the body and the onset of the initial stage of smallpox are coincident.

UNKNOWN OR MISSED CASES

It is unnecessary to resort to "missed" cases in this epidemic until it is attempted to account for the sources of infection of the last two cases. These two cases had several points in common. They reported sick at practically the same hour. Each had a good vaccination history and both infections were of extreme virulence. These facts suggest a common source of infection either on shore or on board ship.

Both men had been attached to the same ship for a considerable period of time. It is evident, then, that they either received their infection on that ship or on shore. In regard to receiving it on shore, their ship had left infected Shanghai, and at the time they were taken ill she had been lying in a port on the Siberian coast for a period of six weeks. There was plenty of smallpox on shore, but it was not of the so-called Shanghai variety. No. 8 had not been on shore for thirty days prior to the onset of his disease and No. 7 had had but one liberty, March 19, during the four weeks previous to his illness. These men were not even acquainted with each other. They were from different and remote parts of the ship. They had not been ashore together nor had they been ashore on the same day. It is practically impossible, then, to construct a theory by which these two men secured their infection on shore, and certainly no shore infection theory can explain how they happened to be stricken by infections of similar virulence and at practically the same hour.

It now remains to trace these two final infections to a source on board ship. The last previous case developed on board March 9 and left the ship March 12 in the second day of the eruptive stage. The interval of time from this case till the two final cases occurred is too long to be considered as a period of incubation. As a matter of fact it amounts to about two normal incubation periods. Before reporting sick, and while the character of his illness was being determined, No. 6 must have had many opportunities on board a crowded ship to infect hundreds of others. With some of these the infection may have succeeded in establishing an extremely mild form of the disease. These mild forms may readily escape recognition. Such unknown cases in epidemiological work are classified as "missed" cases. The infection disseminated by missed cases may result in any variety of the disease. Cases of confluent or purpuric smallpox are just as apt to follow infection by these mild

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cases as from any other form.[4] It is likely that missed cases were present at this time and resulted in carrying over the epidemic from Case No. 6 to the two final cases, which were that type of smallpox said to be as apt to appear in individuals who have been vaccinated as in those who have not.[5]

VACCINATION IN SERIES

At various intervals of time during the past year, all or parts of the crew had been subjected to frequent vaccinations. The day the ship first entered the port of Shanghai every officer and member of the crew were vaccinated. Also the occurrence of a case of smallpox among the crew was always made the occasion to vaccinate all persons on board. At other times, specially selected groups of men were vaccinated. For instance, one of these groups included all men whose records did not show the presence of one or more scars prior to enlistment. If there were added to these vaccinations those which the Army Regulations require to be given on board the transports to all men who are going to the East and those which the Navy Regulations require at all training stations and also the few that may have been received in civil life, it is seen that the members of this crew were a thoroughly vaccinated group of men.

The epidemiological evidence that "missed" cases had been present and the actual presence among the crew of smallpox, even though of a rare type, were indications that not all the immunity obtainable existed in all the members of the crew. Consequently a series of vaccinations was begun. First, on April 13, the entire personnel of the ship, consisting of 740 officers and men, was vaccinated. When these arms were examined, 241 men were excused from further vaccination on account of manifesting either (*a*) an immunity reaction, (*b*) indications of an accelerated "take," or (*c*) the presence of sufficient evidence of a recent successful vaccination to warrant the assumption that further attempts would be useless. One week later, April 20, the remaining 499 were again vaccinated and, upon inspection, 109 were excused. Another week later, April 27, the remaining 390 men were vaccinated for the third time, and their arms were examined upon the following second, fourth and sixth days.

The most interesting phenomenon to be observed during this series, totaling 1,629 vaccinations, was that known as "retardation." Those who were making the examinations soon adopted the term "flare-up" to describe these atypical results. By this they meant those instances in which the original vaccination became active after a re-vaccination had been performed and apparently in consequence of the second attempt to vaccinate. This atypical form of vaccinia occurred with surprising

[4] Councilman in Osler's "Modern Medicine," 1st Edition, Vol. ii, p. 282.
[5] *Ibid.*, p. 284.

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frequency, but unfortunately the number of instances in which it was observed was not made a matter of record. At least one instance is recalled in which the first vaccination did not become active until after two re-vaccinations had been made. This instance occurred in a young man who was vaccinated upon all three dates. When his arm was examined upon the fourth day after the third attempt to vaccinate, a marked "retardation" result was observed at the site of the original attempt to vaccinate. The second and intermediate lesion exhibited no change except a slight increase in tenderness of that area. The original vaccination presented a "raspberry excrescence" with a large, red areola.

There were no further cases of smallpox following this series of vaccinations. If the degree and duration of immunity obtained are directly proportional to the typical nature of the "take,"[6] then little immunity was established by these 1,629 vaccinations. None of the takes was typical. In this respect, the reactions from the vaccinations parallel the epidemic of smallpox in that neither presents a typical case. All of the so-called successful vaccinations resulted in atypical vaccinia and could be classified as belonging to one form or another of "variation in the evolution of pock."[7] "These incomplete lesions have an important but still unsettled bearing on the completeness of immunity. They often result from and indicate imperfect immunity, and the partial success may be said to increase the immunity."[8] Speaking for the practical workers, that is, those who handled the epidemic and its attendant vaccinations, they were so impressed by what they saw that there was no doubt in their minds that these incomplete takes had considerable value and served to bring the supposedly imperfect immunity nearer to the maximum obtainable.

THE EAST A CONSTANT SOURCE OF INFECTION

The absence of sanitation in the Orient, and the remarkable virulence of the infections there, are actually a world problem. Cholera, plague, smallpox, diphtheria, influenza and other less important epidemic diseases not only trace their origins to Eastern sources, but these diseases also have permanent homes there. For centuries, epidemics from these sources have swept over Western civilization destroying more lives than all the battles fought in its cause. The loss of life from wars has generally been considered a necessary sacrifice made in the cause of human freedom. For those lives consumed by epidemics, the Western mind

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[6] "Preventive Medicine and Hygiene," Rosenau, 3rd Edition, p. 17.
[7] Wilson in "Modern Clinical Medicine (Infectious Diseases), p. 451.
[8] Doek in Osler's "Modern Medicine," 1st Edition, Vol. ii, p. 318.

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has assumed a somewhat Oriental attitude; that is, an attitude largely tinged with helplessness and fatalism.

But this attitude will change when the immediate world problem has been attended to. Then the remote parts of the world will be in closer touch with other parts than ever before. Eastern ills will more quickly become Western ills, and, perhaps, *vice versa*. There will be a fuller realization by civilized people of the fact that epidemics live only by human sickness and death. There will also be a greater willingness on the part of the public to accept the responsibility for the solution of world problems. It is to be hoped that, when the change shall be made, some better method of protection from these epidemics will be found than the past ineffectual one of unpopular quarantine and other regulations which interfere with commerce and inconvenience travel.

An ideal solution of this problem would be to wipe out these epidemic sources by the introduction of the methods of modern sanitary science. If the demonology of the East could be replaced by an equal belief in the efficiency of modern preventive medicine as a means to ward off disease, then the problem would be almost solved. For a half century, men and women, most of whom have been missionaries, have worked, with a faith that would not be discouraged, for an end that would bring about this change. Beyond doubt, they have accomplished a great deal of good. But this optimism is not shared by many practical minds who know something of Eastern thought and civilization. According to their views the East is still the East and always will be.

CONCLUSIONS

1. When virulent smallpox appears in an individual who possesses a considerable immunity, it is more likely to assume either a very mild or a very severe form than it is to assume the intermediate and usual form.

2. A successful vaccination made during the period of incubation may prolong the period to as much as twenty-five days.

3. If a group of men be sufficiently large and human intercourse sufficiently intensified, it may be expected that exposure to the most virulent variety of smallpox will overcome the immunity in several instances, even though the group be considered thoroughly vaccinated.

4. In the presence of a virulent epidemic of smallpox, at least three vaccinations in series of one week's interval should be resorted to, as this method seems to obtain a large number of "retardation" takes which in all probability have considerable immunizing power.

5. The epidemic diseases of the East are a constant menace to the rest of the world, and, on account of Eastern conservatism, it is likely that this condition will continue for many years to come.

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THE PHYSICAL AND MENTAL TRAINING OF CONVALESCENTS AT BASE HOSPITAL, CAMP ZACHARY TAYLOR, KENTUCKY

By Major SIDNEY J. MEYERS
Medical Corps, U. S. Army

THE convalescent camp consists of twelve barracks, each a two-story building with four wards, accommodating 76 patients. Each ward has a latrine and shower bath, with usual toilet facilities. On one side of each barrack, both up and down stairs, is a large screened porch, which affords rest and shelter. The ward rooms, that space in the center of the building between wards, are comfortably and attractively furnished, and are for the use of patients for receiving relatives and friends, for amusements and letter writing. The porches are furnished with many easy chairs, hammocks and swings, and, as fresh air and sunshine are so essential to our convalescents, patients are kept out of the wards except to sleep. These barracks are connected with the base hospital by covered corridors and so protect against the rain and snow. In the center of the convalescent camp the Red Cross and Y. M. C. A. have each erected buildings for the execution of their usual activities.

This camp was occupied May 1, 1918, and, necessarily, little in the way of reconstruction has been done here. The defects here are easy to remedy, and the results striking. Our energies have been spent on the training of convalescents.

REASONS FOR ESTABLISHMENT

1. Here opportunity for speedy convalescence is afforded to sick soldiers, who have favorably progressed beyond the acute stage of active disease.

2. The important period of the patient's complete recovery is bridged over, *i. e.*, that period between acute disease in the hospital ward and full duty in his command. This is probably one of the greatest advantages of this hardening process, which is accompanied by progressively increased nourishment, frequent baths, exercise, walks, drills, recreation, games, music, and directed play.

3. Each day certain hours are devoted to educational purposes, which include instruction in military regulations, personal and

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sexual hygiene, and venereal prophylaxis, information regarding cause, spread and control of communicable diseases; practical demonstrations and training in rope tying and splicing, engineering, panoramic sketching, etc.

4. Observations are made regarding the value of fresh air, sunlight, adequate diet, directed play, etc., in subacute and chronic diseases which come from the base hospital. The following administrative scheme was instituted: The service is in charge of a medical officer, known as chief of convalescent service, under the direction of the commanding officer of the base hospital. Detailed from the line is an officer, who has charge of all the activities, approved by the chief of service. Noncommissioned officers form a detail of instructors under the line officer. The plan of combining selected instruction with pleasure during the convalescent period originated with Col. Sidney A. Cloman, Commanding Officer, 159th Depot Brigade, and Lieut. Col. Will L. Pyles, M. C., Commanding Officer of this base hospital. Whatever success may have been attained in the service has been due to the continued interest and advice of Lieutenant Colonel Pyles.

Of primary importance in beginning this service was establishing the type of patient to be admitted, and the rules, which have not been altered, are here given:

Rules for Transfer of Patients to Convalescent Barracks—(1) Only ambulatory patients will be transferred. Patients must be able to walk to and from convalescent barracks to patient's mess in base hospital. (2) Patients must have normal temperature, both in morning and afternoon for two days preceding transfer.

The following are not suitable cases for transfer: (1) Patients suffering from respiratory diseases, accompanied by nose and throat discharges. (2) Patients requiring special diets on account of gastro-intestinal or renal conditions. (3) Patients suffering from parasitic diseases, malaria, intestinal parasites, including tapeworm, and skin parasites. (4) Patients suffering from cardiac conditions, accompanied by evidence of decompensation. (5) Patients suffering con-venereal diseases and infectious eye diseases. (6) Patients convalescing from any of the following contagious diseases: mumps, influenza, scarlet fever, chicken pox, smallpox, diphtheria, erysipelas, or meningitis. Patients recovering from measles may be transferred to the convalescent camp two weeks from date of onset of the eruption, provided they are otherwise well.

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Patients in base hospital group are not permitted to visit the convalescent barracks.

Scheme of Admission.—Patients sent to the convalescent service are admitted daily at a certain time, from the base hospital, and their briefs accompany them; each patient's brief must be completed up to the date of the transfer by the ward surgeon before it is accepted. This accomplishes the purpose of giving the convalescent service all information concerning the patient. Attached to the brief the following memorandum is sent to the convalescent service by the ward surgeon making the transfer, for his recommendation as to further care, and when concurred in by the surgeon of the convalescent camp is carried out.

Name: .....
Rank: ..... Organization: .....
Ward: ..... Date: .....
Date admitted to hospital: .....
Length of time in hospital: .....
.....
Diagnosis: .....
Streptococcus carrier: .....
Recommended care in convalescent camp: .....
.....
Group:
.....
Special instruction: .....
.....
Ward Surgeon.
.....
Chief of Service.

On admittance patients are seen by the surgeon in charge or his assistant, and if considered suitable for the convalescent camp, are admitted. If found not to be acceptable, they are returned through the receiving ward for further treatment in the base hospital.

The idea of the convalescent camp is not only to place the men in better physical condition to return to their organization, but also to prevent, so far as may be possible, loss of time from the army training. To this end the patients are classified at once, upon admission to the convalescent barracks, into four groups.

The first group consists of resting cases. These patients will walk to the mess hall for meals and also to lectures, as empyema and cardiovascular cases. The second group is composed of those able to take light exercise. They go out on short walks, participate in some

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light exercise, and are always accompanied by a medical officer, as mastoid and respiratory cases. The third group includes those able to drill; the drill periods are short, only for an hour at a time, as eye, ear, and throat, suitable surgical cases, etc. The fourth group is known as the reconstruction class—men coming into the army through selective draft who are found to have slight physical disabilities. These are assigned to this section for improvement so they will be eligible for general military service. Special physical exercises are prescribed for each individual to meet the requirements, as types of orthopedic cases.

By the segregation of patients in the convalescent camp, the cardiovascular cases are placed in one barrack, the convalescent surgical cases in another, the respiratory in another, etc.

A part of one barrack has been given over to the Disability Board and the Cardiovascular and Tuberculosis Boards. It is entirely distinct and separate from the hospital, but its location is ideal and its purposes are well served as a meeting place of these three boards as the distance is short between the hospital and the boards. Many patients are sent to these boards daily, thus serving another purpose, viz., expedience in sending men to duty and in discharging them from service.

Ward Rules—While the convalescent barracks serve as a club house for physical relaxation and where pleasant and profitable mental occupations tend to prompt recovery, patients are still under the guidance of ward surgeons and discipline must be maintained. The following ward rules have been formulated and have been carried into effect, and seem to serve the purpose for the guidance and maintenance of a well-regulated convalescent camp.

Temperatures of all patients are taken by the nurse and recorded night and morning. This serves two purposes, as it would detect an illness otherwise overlooked, and also gives a check on anyone who might be absent from the barracks.

All patients are required to bathe as directed by the ward surgeon. Of primary importance is the personal hygiene of the patients, and this is brought to their attention by the surgeon in charge.

All patients are given light duty, to police and maintain perfect cleanliness in every part of the convalescent camp; but this work is voluntary and any patient unable to perform any duty, and who reports his inability to the ward surgeon, is immediately excused.

Smoking is permissible on porches, where necessary facilities are supplied.

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All patients going to their mess, while on marches or taking exercises, are always properly clothed, varying with temperature, weather, etc., according to the judgment of the ward surgeon.

All physical exercises are under the guidance of the ward surgeon, but it is not compulsory for patients to participate in amusements, exercises, lectures, or talks.

No patients are permitted to leave the barracks without the consent of the ward surgeon, nor are they allowed to visit base hospital or canteen. Purchases may be made for the patients by the ward-master when permitted by the ward surgeon.

Individual drinking cups are supplied and must be used.

During all activities in this camp, those not participating must be at rest.

Patients are not permitted to keep food in the barracks.

While all duties and instructions are entirely voluntary, yet it has been noted in this service that nearly all men able to participate are actually eager to take part, and they not only show an inclination, but a desire; and many of them express enthusiasm. Our recommendation is to further continue the voluntary assumption of these responsibilities. Discipline is obtained and is of great importance in the conduct of the convalescent camp, as it is in all other parts of the service.

A room, properly equipped for the care of the patients, is reserved in each barrack, pending prompt removal to the base hospital for observation in case of illness. It is not the purpose here, not the intention, when a convalescent becomes acutely ill, to observe him and make a diagnosis. He is immediately returned to the hospital, where proper facilities are at hand, for delay might cause some epidemic.

It is very important to arrange the time, so as to give varied physical and mental exercises, with plenty of rest, and to this end a regular schedule was arranged, the first week of which is given. These are changed every three weeks, as the patients average this time in the hospital.

To appreciate the work it would be well to follow through one day and briefly rehearse its routine. Patients are assembled for morning mess, each barrack in charge of a noncommissioned officer, and walk, not march, to mess hall in base hospital, a distance of about three hundred yards. They are made to walk slowly, at good distance apart, as crowding is to be avoided. At mess hall they do not intermingle with base hospital patients, and they return to barracks in the same manner.

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Patients returning from breakfast begin policing the barracks, making up beds, which is taught new patients by the nurse, sweeping and mopping of floors, in wards, ward rooms, porches, latrines and corridors. At 8:30 a. m. bugle sounds sick call, and the men await the ward surgeon for inspection. This inspection is to determine any sick, as well as to consider complaints often harbored by the sick. All ill patients are immediately sent to base hospital. Complaints are usually insignificant, easily remedied, and satisfactorily adjusted. Temperatures and pulse are taken during the morning, and, where abnormal, are reported by the nurse to the ward surgeon.

SPECIAL COURSE OF INSTRUCTION FOR CONVALESCENTS IN BASE HOSPITAL

First Week

DAY	A.M. 8.30-9.30	9.30-10.00 A.M. Groups 2 & 4	9.30-10.00 A.M. Group 3	A.M. 10.00-10.30	A.M. 10.30-11.00		P.M. 12.30-1.15	1.15-2.00 P.M. Week 1	1.15-2.00 P.M. 2	1.15-2.00 P.M. 3	1.15-2.00 P.M.	2.00-2.30	2.30-3.15 P.M. Week 1	2.30-3.15 P.M. 2	2.30-3.15 P.M. 3	2.30-3.15 P.M. 4 & 5	P.M. 3.15-4.15
MONDAY		Exercise under Surgeon	I.D.R					Signalling	Packing Knapsacks	Sighting Drill	Engineering						
TUESDAY	Medical Inspection	Do	Do					Engineering	Sighting	Signalling	Packing Knapsacks		Sighting Drill	Engineering	Packing Knapsacks	Signalling	
WEDNESDAY		Do	Hike														
THURSDAY		Do	I.D.R	Rest	Lecture	Dinner	Rest	Engineering	Signalling	Sketching	Engineering	Sighting Drill	Rest	Sketching	Signalling	Sighting Drill	Engineering
FRIDAY		Do	Do					Engineering	Sighting Drill	Signalling	Sketching			Sighting Drill	Engineering	Sketching	Signalling
SATURDAY		Do	Hike														

Taking Temperature and Medical Inspection

Between 8 and 9 a. m. the chief of service examines and passes on all cases to be discharged to duty, to be sent before the Disability Board, and for consultation. At 9.30 men are assembled in front of the barracks and a two-minute talk is given by the chief of service. This is usually advice as to discipline and sanitation, or upon subjects vital to the conduct of this camp. Here all men are grouped and those weak, ill or not wanting to participate in the exercises are allowed to fall out and form another group. This last squad are given setting-up and breathing exercises, for fifteen minutes.

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Group one is returned to the barracks to rest. Group two, under a noncommissioned officer, goes for a walk, slowly, with plenty of resting periods, while number three goes on marches and maneuvers as provided in schedule. Number four is given exercises at the same time, suited to the cases in this group, which is mainly composed of cardiovascular and orthopedic cases.

On all marches, walks and exercises patients are accompanied by a ward surgeon and followed by an ambulance. Only on two occasions was anyone brought back in the ambulance, and these for fatigue. Upon return to camp at 10.30 each morning a talk of one-half hour is given by some authority on some subject of vital importance to the new soldier. They are interesting, plainly presented, and necessary. The men seem eager to learn and always appear in large numbers. Reference can be made to the program for subjects. We again have a rest period, during which time and at other times patients are allowed and invited to use all material in the wards for their education and entertainment.

Each barrack is supplied with a portable buzzer and sounder for each ward, with one in each hall on the second story. In each ward there is a placard, three and one-half by two and one-half, showing the positions of the Semaphore, and another of the same size showing the International code, also equipment for flash-light signaling. There are thirty U. S. Rifles, Model 1917, besides ten boards, each with a rifle completely dissected and parts labeled. There are twelve individual ordnance equipments, complete, and twenty-four complete Hollifield target devices. Besides these there are two hundred flags for semaphore work, two thousand pocket signal disks, and military maps of Gettysburg and Antietam. Each barrack is also supplied with a knot board, exhibiting the various knots employed in the military service.

Two afternoon classes from 1.45 to 3.00, with rest between, furnish the day's exercise (see program), except that after supper elementary classes in English and French are held for those who care to learn.

On holiday afternoons no instruction is had, and usually a band concert is given for the patients' pleasure.

While the days seem full of entertainment, drill and instruction, time is found to send patients who need dental work, selective operations, such as tonsillectomy, herniotomy, etc., to the respective departments, provided their general condition permits. Patients are

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Statistical Report of Work Done

	Completed cases. Patients discharged from the convalescent service								Incomplete cases. Patients in convalescent barracks				
	Returned to duty	Returned to base hospital	Discharged from service	Total number patients	Total days in base hospital	Average number days in base hospital	Total days in barracks	Average number days in barracks	Total number patients	Total days in base hospital	Average number days in base hospital	Total days in barracks	Average number days in barracks
Medical	217	43	14	274	7,476	27.2	3,136	11.4	140	3,928	28.0	3,165	22.6
Surgical	99	3	3	105	3,245	30.9	1,559	13.9	90	3,333	37.0	1,209	13.9
Genito-urinary	4	0	0	4	356	89.0	32	8.0	3	73	24.3	54	18.0
Nose and throat	33	3	0	36	2,155	59.8	441	12.2	9	492	54.6	173	19.2
Orthopedic	4	1	1	6	213	35.5	108	18.0	6	257	42.8	95	15.8
Totals	357	50	18	425	13,445	31.6	5,276	12.4	248	8,083	32.6	4,696	18.9
Pneumonia	27	3	0	30	1,183	39.4	401	13.4	23	870	37.8	318	13.8
Empyema	15	2	1	18	1,633	90.7	184	10.2	25	2,735	109.4	462	18.5
Totals	42	5	1	48	2,816	58.6	585	12.1	48	3,605	75.1	780	16.2
Total cases	399	55	19	473	16,261	34.3	5,861	12.3	296	11,688	39.4	5,476	18.5
Grand total									769	27,949	36.3	11,337	14.7

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also examined for intestinal parasites and are treated if necessary. In many cases, eyes have been examined and glasses fitted.

This hospital has been established just a short time, and it may be too early to come to any definite conclusions, but the statistics may be of some value.

Conclusions—(1) 90 per cent of the patients have taken advantage of the work. (2) Military discipline is strongly emphasized and has obtained the desired results. (3) Model sanitation and policing has resulted. (4) Voluntary service has been successful. (5) Convalescence has been quickened. (6) Morale of the patients made better. (7) Men prepared more completely and rapidly for active duty. (8) Has given valuable information to men during time otherwise lost. In month of February, 1918, the aggregate number of days lost in the base hospital amounted to seventy-two years. (9) The wisdom in selecting cases for this camp is shown by the non-occurrence here of contagious or infectious diseases. (10) Men have been reclaimed who would otherwise have been found unfit for military service. (11) The wide limits of expansion of this service can easily be appreciated.

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THE NECESSITY FOR PROMPT MANAGEMENT OF FRACTURES OF THE NOSE

By Captain LEE COHEN

Medical Corps, United States Army

THE frequency of fractures and injuries to the nose in the line of military duty makes it appear most opportune to place on record some observations and experiences which have proven of value in the management and care of recent fractures of the nose.

In order to obviate distressing deformities, as well as difficulty in nasal breathing, certain to follow most of these injuries when badly managed, the writer desires to lay particular stress upon the importance of *prompt reduction* of the fracture and the maintenance of the bones in their proper relation by suitable packing and splints. Emphasis should be laid upon the use of packing and the proper splint in every case. I can in no way agree with those authors who assert that the broken nose, when reduced, will remain in its proper place unaided, and that little help is derived from the use of an external splint and proper packing of the vestibule. Nor can I see any necessity for subjecting the patient to the discomfort of a complex metal bridge supported from the teeth, as has been advocated by some authorities, when the simple method here described yields perfectly satisfactory results.

A prevailing idea that treatment should be deferred until the disappearance of swelling or the healing of a possible wound of the soft parts, in case of compound fracture, is entirely erroneous. Such a course can only lead to greater difficulty in the correction of the deformity following such delayed treatment. Deformities which could be obviated by simple reduction in the first instance can only be corrected later by subjecting the patient to the painful procedure of refracturing the nose.

The result of a direct blow upon the nasal bones from the front generally drives these bones inward, making the nose appear broader and flattened. At the same time the nasal septum may be broken and displaced, with resultant obstruction of the nasal passages. Should the impact be against the cartilaginous instead of the bony portion, the lower (cartilaginous) part of the nose is driven inward and separated from its attachment to the nasal bones. The deformity, in such instance, is a depression between the two portions of the nose.

A blow directed from the side may completely fracture both nasal

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bones, severing their connection entirely from the frontal bone above and the nasal processes of the superior maxilla below. In such cases the nose is driven to one side, frequently with such force as to cause it to lie over on the cheek. A blow of lesser force from the same direction might only fracture completely the nasal bone on one side, driving it into the vestibule of the nose. In children, a complete fracture of one nasal bone may be accompanied by a partial or green stick fracture of its fellow. Recognition of this type of injury is very important if one would succeed in proper reduction.

Detection of the fracture, though at times made more difficult by the enormity of the swelling, is on the whole rather easily accomplished. A careful comparison of the relationship of the middle line of the forehead, the tip of the nose, and the middle line of the chin is often sufficient to convince one of the existence of fracture. Palpation enables us to ascertain whether the break involves one or both nasal bones. By careful digital manipulation any irregularity in the contour of the nasal arch, or any displacement, can at once be recognized. Crepitus is often manifest, but force should not be employed to elicit this sign. The finger manipulation generally causes but little discomfort to the patient. An X-ray picture frequently clears up the matter, but is by no means essential in making the diagnosis.

When confronted with a *compound fracture*, the only difference in management consists in thorough cleansing and, if necessary, suture of the wound. In addition to the usual dressing, a thin layer of gauze should also be placed over the wound before applying the splint.

Should the accident have occurred under such conditions that tetanus might develop, a preventive dose of anti-tetanus serum should always be administered.

It is most essential, in the reduction of all fractures, to first thoroughly mobilize the entire bony framework of the nose, so that when placed in the splint it may be practically remolded into proper form. Unless this is done, reduction cannot be satisfactorily accomplished, and even if the reduction seems successful there is always a tendency of the nose to assume a faulty position, which grows more manifest as the swelling disappears. This is especially true where there is complete fracture of one nasal bone and incomplete fracture of the other.

Method of Mobilization.—The nasal bone is firmly grasped with the Carter-Adams forceps, one blade of which is introduced into the vestibule of the nose, and the other blade (covered with rubber tubing to avoid injury to the skin) is placed on the outside. The bone is twisted with sufficient force to assure complete mobilization. The same process is repeated with the nasal bone of the other side.

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Following this, the Carter-Adams forceps, both blades bare, are introduced into the nostrils, parallel with and directly beneath the nasal bones, one blade on either side of the septum, so that, by a lifting and twisting movement, the nasal bones can be brought forward and upward into their proper relation with the frontal bone above and the nasal processes of the superior maxilla below. This manipulation serves at the same time to bring the septum of the nose into proper alignment.

To retain the desired position and to secure satisfactory cosmetic results, the nasal vestibule must now be lightly packed with iodoform nu-gauze tape one-half inch wide. The index finger and thumb of the operator on the outside of the nose, while this packing is being introduced, prevents bony fragment from being forced too far toward the skin and out of alignment. The packing further serves to prevent a subsequent dislocation of the bone inward toward the nasal chamber.

A copper splint, made to fit each individual case, is then applied. To properly construct such splint it is best to first make a paper pattern over the nose, by which the splint is then cut from twenty-four gage sheet copper with a small pair of tinner's shears. The rough edges must be made smooth with a file and emory cloth, then both sides smoothly covered with adhesive plaster, to further insure the skin from injury. The splint is next shaped over a small tube or cylinder—the leg of an operating room stool serves for this purpose—thus giving it the proper form to fit over the nose like a saddle. In order to avoid undue pressure upon the skin of the nose, the splint is further lined with a single layer of surgeon's lint, the fluffy side next to the skin. To prevent any tendency toward wrinkling of this lint lining, it has been found necessary to stick adhesive plaster on its smooth side, thus giving it sufficient body to prevent folding during manipulation in placing the splint. It is well to keep a large sheet of surgeon's lint, with adhesive plaster thus attached, on hand, from which linings may be cut when needed.

When in position the splint is held by an inch wide strip of adhesive plaster, extending across the nose and face from beneath one ear to the other. A small strip of adhesive plaster extending from the forehead down to the lower end of the splint, reenforced by two cross strips on the forehead and one over the upper and lower ends of the splint, prevents any tendency of the splint to slide downward and cause undue pressure on the tip of the nose.

Before placing any of these accessory strips, however, the tension of the main strip of adhesive plaster crossing the face should be carefully tested, to make certain that it is equal on both sides; otherwise the nose will be drawn out of alignment. Should the tension be found greater on one side than on the other, that part of the adhesive plaster sticking to

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the splint can be raised with ease by the use of a small elevator. Before using the elevator it should be well heated over an alcohol flame, to prevent the adhesive plaster from sticking to the instrument.

A pencil dot on the center of the splint above, and one at a corresponding point on the main strip of plaster, aid much in judging the change necessary in the tension from one side to the other. The elevator mentioned, not so highly heated, will, when applied like a flat iron over the adhesive strips, serve to increase the sticking quality of the plaster, which might otherwise slip.

In all cases where there is a tendency of the tip of the nose to sag downward, it is advisable, before placing the splint, to support the tip with a sling of adhesive plaster, extending down the full length of one side of the nose, around the tip, and up on the other side. This is especially necessary where the cartilaginous portion has been torn away from its attachment to the bony portion of the nose.

The first dressing is left untouched for four days. After this it is changed every third day. At each change of dressing the nose is irrigated with normal salt solution and the skin cleansed with 95 per cent alcohol. The packing in the vestibule need not be continued longer than ten days, but the splint should be worn continuously for from three to four weeks. The patient in the meantime may attend to his usual duties. In no instance has a patient complained of discomfort from this type of dressing.

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A CONTRIBUTION TO THE PROBLEM OF SYPHILIS IN ITS RELATION TO CENTRAL NERVOUS SYSTEM

By 1st Lieutenant LEON H. CORNWALL
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INTRODUCTION

WITH the demonstration of a positive Wassermann reaction in the spinal fluid by Plaut[1] in 1906 and the subsequent discovery of the treponema pallidum in the lesions of paresis[2] and tabes dorsalis,[3] a new conception of the etiological relationship of lues to nervous diseases was given us. No longer are paresis, tabes dorsalis and allied lesions considered metaluetic or paraluetic diseases. They are true luetic diseases *per se*.

Study of the spinal fluid, first stimulated by the admirable work of Quincke,[4] has now become a routine procedure in all diseases of the cerebrospinal axis. This has made rachicentesis a procedure of enhanced importance. A familiarity with its technique is required of every army hospital surgeon. The postulate that every case with symptons of disease (organic or functional) of the central nervous system should have a lumbar puncture, will meet with the approval of neurologist, psychiatrist, and pathologist. In the interest of scientific exactness, it is hoped that the general clinician will subscribe to the same view.

In addition to the imperativeness of a lumbar puncture in diseases with nermous symptoms, the reports of Ravaut,[5] Nonne,[6] Plaut,[1] Rehm,[7] Gennerich,[8] Altman and Dreyfus,[9] Fordyce,[10] Swift and Ellis,[11] and Miller and Levy,[12] demonstrate its necessity in primary, secondary and tertiary syphilis even in the absence of symptoms pointing to the central nervous system.

Approximately 70 per cent of cases of lues in the secondary stage, especially those with cutaneous lesions other than roseola, show pathological alterations of the spinal fluid.[5] This fact justifies the conclusion that the potential foci for the subsequent development of meningeal, vascular or parenchymatous lesions are implanted in the delicate nerve tissue early in the course of a luetic infection. Here, then, is the critical period for the discovery of these foci and for the application of therapeutic measures aimed at their eradication before irreparable pathological damage is done.

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The measures of lumbar puncture and intraspinal treatment are at our disposal for this purpose if we but apply them.

The statement of Näcke that only a congenitally weakened brain is capable of developing paresis is open to grave doubt. Neisser's dictum that the spinal fluid should be examined in every case of lues before discontinuing treatment was never truer than it is today in the light of our clinical and pathological knowledge. To the army surgeon, who so frequently is required to distinguish real and apparent malingering, a task fraught with great difficulties to avoid injustice to the man and army, the lumbar puncture is of inestimable value as a bulwark of diagnostic defense. Its use, together with every known laboratory test, cannot be too strongly urged in every case with such complaints as headache, vertigo, obscure gastric symptoms, vague body pains, weakness of the extremities, etc., when the etiology is not clear. The diagnosis of neurasthenia and malingering should not be made in any base or other immobile hospital, where the facilities for laboratory examinations are at hand, without a lumbar puncture and complete examination of the spinal fluid.

The spinal fluids upon which this report is based came from the wards of the New York City Hospital and the neurological clinic of Dr. Frederick Tilney at Columbia University (Vanderbilt clinic). They were selected from a series of 600 fluids. There was an intimate coöperation between the clinical and laboratory staffs in the diagnosis and classification of the cases. The necessity for correlation of clinical observations and laboratory results cannot be overestimated. Miller[18] has fortunately stated that "the value and interpretation of any laboratory method should always be based upon the most careful study of the cases in which it is applied." The converse is equally valid that diagnostic dogma, unsupported by laboratory results, has no place in twentieth century medicine.

There still are and, more's the pity, probably always will be a few persons of narrow vision and still narrower experience, who demand 100 per cent perfection of the laboratory, but, with child-like reliance on the infallibility of their own special senses, are content with one-tenth that degree of proficiency in themselves. Happily the army is free from that class. Its medical personnel is taught to employ every means at hand for accuracy in diagnosis.

PRESSURE ESTIMATIONS

Estimations of the pressure of the cerebrospinal fluid have not met with any enthusiastic advocacy, nor have results been

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reported sufficiently significant to attribute to this procedure any great diagnostic value. Obviously, the most accurate method for registering the pressure is by means of a manometer, an instrument which has never enjoyed general use. Without such an instrument, wide variations in pressure estimations are bound to occur, due to the personal equation.

Statements contained in the literature as to normal pressure are so variable, due to the many types of instruments employed, as to cause no little confusion. Although up to the present time the methods of pressure estimation have not yielded results of great value, it would seem unwise to disregard entirely this point, because, with improved methods and careful investigation, information of value may be obtained. The time required for such an estimation at the time of puncture is so slight as to offer no objection. With this view point regarding pressure, it has been our custom to estimate it at the time of the puncture. For a long time it was our custom to express it in terms of "pluses," (1, 2, 3, and 4 plus), based arbitrarily upon judgment obtained from the observation of a considerable number of cases. Obviously one's judgment is subject to marked differences from time to time, and such a method of estimation is of little or no value to anyone except the operator. There are several well-recognized factors which influence the rate of flow under normal conditions:

1. The rates varies directly with the calibration of the needle.

2. In the upright position the pressure is greater than in the recumbent posture.

3. The position of the needle in the subdural space is of importance in guarding against fallacious conclusions. Often a small blood-clot, a piece of connective tissue, a piece of the thecal membranes, or a part of the cauda equina may drift against the end of the needle, impeding the outflow of fluid. Such obstructions may be readily removed by changing the position of the needle slightly, or by passing the stylet through the cannula.

4. Another point worthy of mention is the rapidity of flow often noticed for the first few seconds, which later becomes slower and more uniform. This initial increased rate is due, in our opinion, to a slight invagination of the theca surrounding the needle, thereby producing a moderate local constriction. Such cases should not be judged upon the rate of flow first noted, but upon that observed after the first few seconds.

With a view of making a table of pressure estimations based

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upon the rapidity of flow as estimated by a count of the number of drops per minute, a large number of fluids were counted from cases indiscriminately selected, irrespective of the diagnosis. For this work a platinum iridium needle of No. 17 caliber was used, and the patients were in the lateral recumbent position that is customarily employed for intraspinal treatment. From these observations a simple table of numerical pressure values was made.

TABLE I.—*Scheme for Pressure Estimations Based Upon Observations with a No. 17 Bore Needle with Subject in Lateral Recumbent Position*

Diminished	Below 60 per minute
Normal range	60–130 per minute
Increased one plus	130–190 per minute
Increased two plus	190–250 per minute
Increased three plus	250–310 per minute
Increased four plus	Above 310 per minute

The convenience of this table has amply justified itself in furnishing a numerical standard for conveying an idea of the degree of pressure variation. In presenting the results of this simple, if crude, method, we do not want to attribute to it any considerable diagnostic importance, nor to advise its employment in lieu of a manometer, when the latter instrument is at hand. At a later date the comparative observations by this method and the manometric method will be given. More painstaking investigations of pressure variations with a good manometer are to be advised, as valuable information is possible in this field. When needles other than those of the caliber employed for the above are used, it is a simple matter to formulate a similar table for them.

Ordinarily, the time required to obtain the amount of fluid desired after the subarachnoid space is located is from one-quarter of a minute to two minutes. When the rate of flow is 100 or less, per minute, one may count for the entire minute. If the rate is from 100 to 200, it will be found to be more convenient to count the drops for one-half a minute; and similarly, if the rate is 200 or above, one-quarter of a minute is sufficient, because if one takes more time it will be found that more than the desired quantity of fluid will have to be removed.

The amount of fluid to be removed depends upon the rate of flow or pressure and upon the laboratory examinations desired. At present no examination of the cerebrospinal fluid is complete without a cell count, globulin estimation, Wassermann reaction and Lange colloidal gold reaction. Kafka[14] has stated that 7.5 c.c. of fluid is needed for all of the examinations, but in our experience 4 c.c. is the minimum amount with which a complete examination

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is possible. Some normal individuals, and usually all of those suffering from hysteria, neurasthenia and the neuroses, experience reactions following a lumbar puncture. Such reactions are characterized by headaches, nausea, vomiting and pains in the back and legs, which symptoms may persist from one to seven days. The most persistent and distressing symptom is headache, necessitating the use of phenacetine, codeine or even morphine to control it. Absolute quiet in the supine position, with no pillow and the foot of the bed raised, is to be advised in all such cases.

A word of caution is necessary in cases of suspected cerebral tumor, in which class the removal of fluid is not free from danger. Nonne cites thirty reported cases where death followed the puncture in cerebral tumor, and mentions four cases that he observed where death followed lumbar puncture.[15] On the other hand, the same observer states that in 3,000 cases with other diseases he never observed any permanent injurious consequences.

Certain cases with greatly increased pressure are improved by the puncture alone, and it is now legion that paretics frequently show improvement after the removal of the fluid.

From our observations we have adopted a table of amounts of fluid to be removed as governed by the rate of flow.

TABLE II

Diminished rate	4–5 c.c.
Normal rate	5–6 c.c.
One-plus	6–8 c.c.
Two-plus	8–10 c.c.
Three-plus	10–12 c.c,
Four-plus	12–14 c.c. and in some cases more.

Table III shows the incidence of gross pressure changes in luetic diseases:

TABLE III

Disease	No. of fluids	Diminished	Normal	Increased	
				No.	Per cent
Advanced paresis	26	4	2	20	77
Lues without nerve symptoms*	25	1	5	19	76
Early paresis	24	0	9	15	69
Tabes dorsalis	23	2	6	15	65
Cerebrospinal lues	64	3	24	37	58
Tabo-paresis	16	1	7	8	50
Total	178	11	53	114	64

*Primary, 1; secondary, 12; tertiary, 6; latent, 5; congenital, 1. Total, 25.

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Table IV shows the degree of pressure increase in luetic diseases:

TABLE IV

	No.	1-plus	2-plus	3-plus	4-plus
Early paresis	11	2	4	3	2
Advanced paresis	18	5	9	3	1
Tabes dorsalis	11	7	2	2	0
Tabo-paresis	7	5	1	0	1
Cerebrospinal lues	24	7	8	5	4
Lues with no nerve symptoms	13	8	3	1	1
Total	84	34	27	14	9

In paresis and cerebrospinal syphilis, the highest incidence of increase in the pressure was two-plus, while in tabes, tabo-paresis and lues without nerve symptoms the highest incidence was one-plus.

The highest incidence of four-plus, or of very greatly increased pressure, occurred in the cerebrospinal group, with paresis next in frequency.

Diminished presure was noted not infrequently: in cerebrospinal lues, 3 in 64 cases; in tabo-paresis, 1 in 16 cases; in tabes, 2 in 23 cases; in advanced paresis, 4 in 26 cases.

SUMMARY

1. In the absence of a manometer, the significance of pressure estimations may be enhanced by expressing them in numerical terms of the rate of flow, as determined by a count of the number of drops per minute.

2. For uniform results, a needle of known caliber should be used for all work, the position of the patient should be the same, and sufficient experience is required to make certain that there is no mechanical obstruction to the tip of the needle.

3. The first few drops should not be counted, because of the increased pressure frequently caused by an invagination of the theca around the needle producing a local constriction.

4. There is a tendency for the pressure to be increased in all forms of luetic involvement. It is more frequent in advanced paresis than in other diseases of luetic origin.

5. The amount of fluid removed in all cases should be governed by the pressure (4-14 c.c.).

6. Symptoms are relieved by puncture alone in many cases with increased pressure, notably paresis.

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7. In cerebral tumor cases only a small amount of fluid should be removed (4 c.c.).

CELL COUNTS

Because of a rapid disintegration of the cellular elements of the spinal fluid, it is necessary that the cell count be made within half an hour, unless a preservative be mixed with the spinal fluid. One-half per cent acetic acid preserves the leucocytes very satisfactorily. The most accurate and satisfactory method is that by which the spinal fluid is diluted with a methyl violet staining fluid* in an ordinary white blood pipette and one drop counted with a Fuchs-Rosenthal counting chamber. In another place we have described a short method that may be employed for making the cell count without any further sacrifice in the accuracy.[16]

As in the case of the globulin content, a cell count alone furnishes very incomplete information upon which to base a diagnosis. It must be considered in connection with the rest of the serology.

The cells are increased in paresis, tabes dorsalis, cerebrospinal syphilis, anterior-poliomyelitis, meningitis, and other organic lesions of the central nervous system, especially those involving the meninges. Syphilitic diseases, anterior-poliomyelitis, and tuberculous meningitis are accompanied by an increase in the lymphocytes, whereas in epidemic cerebrospinal and the other infective meningitides the polymorphonuclear leucocytes predominate.

So far it has not been demonstrated that much value can be attached to a differential count of the cells. A complicated technique for this purpose has been described by Alzheimer.[17]

The normal number of cells per cubic millimeter is from one to five; six to nine cells are border-line and ten or more cells constitute a pleocytosis.

The count naturally varies according to the disease and the stage of the disease. The highest counts are encountered in the acute infective meningitides, in many cases too numerous to estimate by routine method, reaching 1,000 or more per cubic millimeter. In anterior-poliomyelitis at its height the cell count may reach 500 per cubic centimeter, but is seldom higher.[16]

Among the syphilitic diseases of the nervous system, considered as a whole, the most frequent degree of pleocytosis is from 10 to 40 cells per cubic centimeter.

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*Methyl violet, 1 gm.; glacial acetic acid, 5.0 c.c.; distilled water, 95.0 c. c. Draw up to 1 in white pipette with diluting fluid and then to 11 with spinal fluid, and, after thorough mixing, place one drop on Fuchs-Rosenthal counting chamber.

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TABLE V.—*Cell Counts of the Spinal Fluid in Leutic Diseases*

Disease	No. case	No. fluids	Nor. 1–5	Bor. 6–9	10–20	25–40	41–100	100–200	200–300	300	Greatest incidence.
Tabo-paresis	10	13	2	0	2	1	3	4	1	0	100–200
Advanced paresis	17	31	2	6	7	3	7	3	2	1	10–100
Early paresis	13	26	3	3	7	3	7	3	0	0	10–100
Cerebrospinal lues	52	76	15	10	16	15	10	6	3	1	6–100
Tabes dorsalis	12	22	4	5	3	5	3	2	0	0	6–40
Lues with no nerve symptoms	57	57	41	10	4	0	2	0	0	0	0–20
Total	161	225	67	34	39	27	32	18	6	2	

The highest counts are in fluids from cerebrospinal luetics. In this type the cells may reach 950. Among 76 fluids one was encountered with that degree of pleocytosis. It was from a case of secondary lues with neuro-retinitis. An excess of 200 cells is occasionally seen, 100 to 200 more frequently, 50 to 100 is quite common, and 10 to 20 the most frequent. Normal counts are present in about 15 per cent of cases.

In endarteritis the counts vary from 10 to 33. Normal counts are present in 10 to 15 per cent.

In paresis the count may vary between the normal and 350. The latter was the highest noted in examinations of 31 paretic fluids. Normal counts occur in about 10 per cent of paretic fluids, either in the very early or very late stage of the disease. The most frequent finding is 10 to 100 cells.

Tabo-paresis has a tendency towards a greater degree of pleocytosis than paresis, counts of 100 to 200 being more frequent than in the latter disease. The maximum number of cells noted in 13 fluids was 237. One encounters normal counts in approximately 15 per cent of cases.

In tabes-dorsalis counts vary from border-line to 135. The higher counts, of course, occur in active and progressive cases, and lower counts in quiescent cases. Fordyce[10] gives 235 as the maximum number of cells in his cases of active tabes. In all types of pure tabes, normal counts are found in about 20 per cent of cases and normal or border-line in 40 per cent of cases.

To emphasize the importance of a complete examination of the spinal fluid before discharging any case of syphilis as cured, attention is called to the fact that in 57 fluids from cases of lues without any nervous symptoms, 28 per cent showed border-line or increased counts and 10 per cent showed a pleocytosis of 10 to 100.

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Owing to the probability of neurotrophic strains of spirochaete pallida, there seems to be a tendency towards moderate skin manifestations in cases of early cerebral or meningeal involvement and vice versa. In this connection there is a significance in the fact that both tissues originate from the primary embryonal ectoderm and the degree of involvement appears to vary inversely.

GLOBULIN

The work of Guillain and Nissl,[18] and Nonne and Appelt,[19] on the protein and globulin content of the spinal fluid may be considered as having stimulated the interest in this feature of spinal fluid examination. Although Kafka[20] and Brandenberg[21] recommend an estimation of the total proteins, the globulin content alone is sufficient for diagnostic purposes.

For the detection of globulin excess the test of Pandy,[22] the Ross Jones[23] modification of the Nonne Phase I reaction, and the butyric acid method of Noguchi[24] offer simple means. The first two methods are superior to the last because of greater delicacy, and are much less disagreeable.

An excess of globulin in itself only signifies an organic lesion of the central nervous system, and has no value for differential diagnosis except when considered in relation to the other laboratory findings.

The globulin was increased in 84 per cent of all fluids from cases of syphilis. In syphilis without symptoms pointing to the central nervous system, there was an excess in 33 of 45 cases, or 73 per cent, whereas in syphilis of the cerebrospinal axis (paresis, tabes dorsalis, tabo-paresis, and the cerebrospinal types) there was a globulin excess in 87 per cent. The order of frequency in which this was noted was:

Tabo-paresis	100%	15 cases
Advanced paresis	97%	31 cases
Early paresis	92%	24 cases
Cerebrospinal type	85%	78 cases
Tabes dorsalis	68%	22 cases

For the estimation of a globulin excess the following arbitrary system of interpreting the degree was employed:

Trace indicates	Very slight increase
One-plus indicates	Slight increase
Two-plus indicates	Moderate increase
Three-plus indicates	Marked increase
Four-plus indicates	Very great increase

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Quantitatively the highest degrees of globulin excess were found in advanced paresis and cerebrospinal syphilis. Early paresis, tabo-paresis, and tabes dorsalis may, not infrequently, be accompanied by only a trace of globulin in the spinal fluid. Such a finding is, however, rare in the advanced stage of paresis.

TABLE VI.—*Showing Globulin Content of the Spinal Fluid in Luetic Diseases.*

Disease	No.	Nor.	Inc.	Per cent inc.	Trace	1 plus	2 plus	3 plus	4 plus
Tabo-paresis	15	0	15	100.0	3	9	1	2	0
Advanced paresis	31	1	30	96.7	0	13	12	3	2
Early paresis	24	2	22	91.6	4	16	2	0	0
Cerebrospinal lues	78	12	66	84.6	13	31	17	5	0
Lues without nerve symptoms	45	12	33	73.3	20	12	1	0	0
Tabes dorsalis	22	7	15	68.1	3	8	3	0	1
Total	215	34	181	84.1	43	89	36	10	3

A lesion of the cord or meninges, producing compression, is the only condition that is accompanied by a four-plus globulin increase. By this is meant a sufficient quantity to produce a broad, dense ring with the Ross-Jones test and an immediate formation of large flocculi with the Noguchi butyric acid test. With the slightest shaking of the tube these flocculi cling to its wall. The reaction is comparable to the change witnessed in a urine with a high albumen content after heating with acetic acid. Any observer who has ever seen such a fluid will readily recognize what is meant by a four-plus excess. It is seldom found except in cases of compression of the cord where it constitutes a part of the Froin snydrome characterized by xanthochromania, spontaneous coagulation en masse, plecytosis and globulin excess.

COLLOIDAL GOLD TEST

Zsigmondy's[25] findings in 1901 concerning the protective action of proteins upon colloidal solutions formed the basis for the investigation of the proteins in the spinal fluid in 1912 by Lange,[26] who discovered that, within certain limits, these proteins, instead of protecting colloidal solutions against precipitation, produced precipitation. This was observed to occur with sufficient frequency in the spinal fluid from cases with syphilis of the nervous system as to make it of value for the differential diagnosis of this disease.

The difficulties in securing uniform solutions of gold chloride offered an obstacle to its general use at first, and the inconstancy

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of the early results discredited the reliability of the test. Since the publication of the admirable work of Miller and his co-workers, Brush, Hammers, and Felton,[27] in 1914 and 1915, in which they so skillfully described the technique for the preparation of the reagent and the application of the test, we have a test which should be routinely employed in the examination of spinal fluids. The methods referred to, with the exception of the use of oxalic acid, have been employed in practically every detail in the preparation of our reagents and, as a result, uniform solutions have been obtained which have conformed to the standards prescribed by Miller.

A simplified technique for the preparation of colloidal gold solutions, obviating the use of oxalic acid by the addition of a larger quantity of formaldehyde at 90° C., is said to possess the advantage of conserving time and producing a less number of worthless solutions. All our solutions were made previous to the reports of Black;[28] therefore we are unable to express an opinion regarding his method, except to say that it commends itself strongly.

Certain precautions are emphasized, namely:

1. The use of a dry sterilized platinum iridium needle.

2. New glassware used for nothing else and cleansed by scrubbing in hot soap and water, rinsing with tap water, and emersing in hot chromic acid solution and rinsing with tap water followed by distilled water.

3. The prevention of contamination of the spinal fluid by blood or microörganisms.

4. Immediate shaking after the addition of gold chloride solution.

If the needle cannot be dry sterilized, it should be boiled in distilled water before use. Blood vitiates the value of the reaction by preventing or increasing the precipitation, depending upon the quantity present.

Examples.—(1) Paretic fluid 5555432100, same with minute quantity of blood, 0455555555.

2. Luetic fluid 1122433210, same with minute quantity of blood, 0455555555.

3. Normal fluid 0000000000, same with minute quantity of blood, 0455555555.

A failure to shake each tube immediately after the addition of the gold chloride solution prevents a uniform dispersion of the colloidal particles. A pale zone of partial decolorization, at the top of the fluid, results.

Chart I illustrates the three most common types of curves with the numbers designating the color changes.

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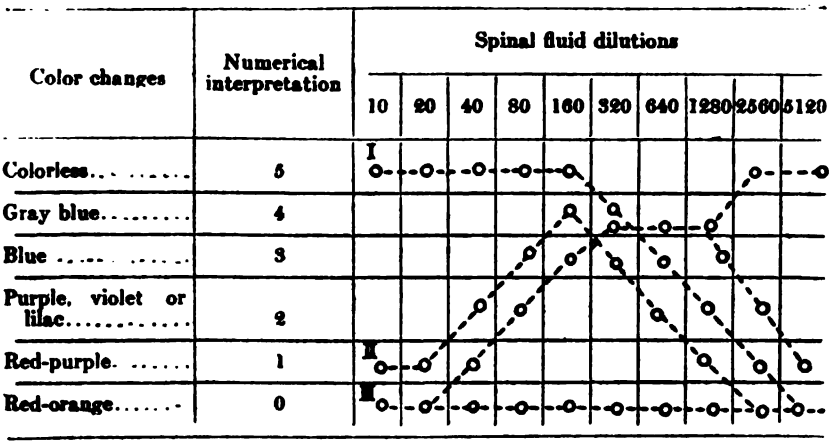
CHART I



0—No reaction (normal.
1—Type I curve (paretic).
2—Type II curve (luetic).
3—Type III curve (meningitic).

Three types of curve have been described and they have been given the nomenclature of the diseases which they commonly accompany. In like manner the zones in which the maximum change takes place have been designated. This is illustrated by Chart I above. Inasmuch as a few older diseases than paresis, lues and meningitis give curves which fall into one or other of the three zones, it would be better to designate the curve as Type I, Type II, or Type III, and similarly the zones as Zone I, Zone II, and Zone III rather than to employ the descriptive terms paretic, luetic and meningitic.

TABLE VII.—*Showing the Incidence of Maximum Color Changes of Colloidal Gold Solutions by the Spinal Fluid in Luetic Diseases*

	No. fluids	Nos. representing color changes						Per cent of Type 1 curves
		5	4	3	2	1	0	
Advanced paresis	42	41	0	0	1	0	0	98.0
Tabo-paresis	25	22	3	0	0	0	0	88.0
Early paresis	32	24	6	0	2	0	0	75.0
Tabes dorsalis	22	3	3	5	7	3	1	14.0
Cerebrospinal lues	102	18	18	24	27	13	2	18.0
Lues without nerve symptoms	57	0	2	2	12	31	10	0.0
Total	280	108	32	31	49	47	13	38.5

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The high incidence of Type I curves in paretic fluids is apparent at a glance (Table VII). In relation to the degree of precipitation, it is of interest to note that tabo-paresis occupies an intermediate position. In other words, the tendency is for the fluid from this disease to decolorize colloidal gold solutions less than advanced paresis and more than early paresis.

TABLE VIII.—*Showing the Incidence of Complete Precipitation of the Colloidal Gold Solutions by the Spinal Fluids of Paresis*

	Complete precipitation						
	5 or more tubes	4 tubes	3 tubes	2 tubes	1 tube	None	Total No.
Advanced paresis.....	25	8	5	3	0	1	42
Tabo-paresis.....	5	6	1	3	7	3	25
Early paresis.....	2	1	10	8	3	8	32
Total.....	32	15	16	14	10	12	99

In considering the dilution in which the maximum degree of precipitation takes place, tabo-paresis again shows a tendency to produce complete precipitation in lower dilutions than advanced paresis but in higher dilutions than early paresis. (Table VIII.)

There is no typical curve for tabes-dorsalis by which it can be distinguished from cerebrospinal lues. In both diseases the majority of curves are in Zone II, the highest incidence of color change being in the shades designated by the numbers 2 and 3. In the tabes series studied, but three fluids produced complete precipitation in one or more tubes. None of these curves was of the typical Type I, although the maximum change occurred in Zone I. One case resembled Type III, two were examples of the effect sometimes noticed after treatment, viz., the change from a Type III to a Type I curve or from a Type II to a Type I curve.

In the cerebrospinal series three cases are worthy of note. Two showed changes in the curves during treatment from Type II to Type I. The interval between the treatment and the subsequent examination was two weeks and ten days respectively and one showed a more marked quantitative change from a Type II curve to one of Type III. These observations suggest the possibility of an early rise and subsequent fall in the colloidal gold curve after treatment.

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Luetic cases having no symptoms of central nervous system involvement and with negative spinal fluid Wassermann reactions give uniformly low curves, the highest incidence of change being to the shades represented by the numbers 1 and 2.

No difference was observed in the meningitis series than has been frequently observed and recorded in the literature, viz., the predominance of Type III curves. Two of the three fluids from eclamptic cases gave Type I curves. None of the cases of multiple sclerosis of our series corresponded to the observations of Miller and Fordyce, who reported having obtained Type I curves in this disease. One case of lateral sclerosis, however, gave such a reaction.

By the method used for reading the reactions included in this report the slightest difference in color from that of the control tube was read as I, which accounts for the small number of absolutely negative reactions.

In view of the high percentage of Type I curves in paresis, may we not conclude that all cases of syphilis giving this curve are potential cases of paresis in what might be termed the preparetic stage, that is, just before sufficient pathology is established to produce clinical symptoms? If such is the case, the colloidal gold reaction is of inestimable value because, by treatment in this stage, we may hope to prevent that most hopeless of all luetic sequelae, general paresis. The positive assurance of preventing one such case in one thousand would be sufficient justification for intraspinal therapy.

SUMMARY

1. Strict attention to all of the details of preparation of reagents, distilled water, and glassware is imperative, else the reaction is valueless.

2. For the detection of the very early stages of paresis with but few symptoms it is the most valuable test that we possess.

3. Unless test tubes are shaken immediately after the addition of the colloidal gold solution to the dilutions of spinal fluid, a typical reactions characterized by a pale zone at the top of the tubes are obtained.

4. Paretic fluids yield the greatest number of reactions, showing complete decolorization of solutions of colloidal gold in Zone I.

Among other diseases without luetic etiology, the spinal fluids of which react in the same manner, are lateral sclerosis, brain tumor, meningitis, and eclampsia.

5. The intensity of the reaction may be temporarily increased after treatment.

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6. Although paresis cannot be diagnosed with certainty from a positive Type I curve, its absence can be assured in 99 to 100 per cent of cases the spinal fluids from which give normal reactions and in 95 per cent of those showing no greater change than a 3.

WASSERMANN REACTION

The Wassermann reaction, like the other tests, does not in itself furnish complete information upon which to base a diagnosis. If, however, one were able to use but one test, this could less be dispensed with than any of the others.

A positive complement fixation reaction in the spinal fluid establishes a diagnosis of luetic involvement of some of the structures of the cerebrospinal axis. Such lesion may be meningeal, parenchymatous or vascular. Its pathology may be only inflammatory or it may be of the type of specific granulomatous infiltration (gumma). Diagnostic conclusions in this regard must be based upon the broader conception which one gains by a careful consideration of the other serological findings together with the clinical findings.

Proper diagnoses can only be arrived at by supplementing the clinical observations with the results of the laboratory. He who bases his conclusions alone on either clinical or laboratory findings to the exclusion of the other does alike an injustice to himself and to his patient. One must not forget, for example, that multiple sclerosis and syphilis of the cerebrospinal type may coexist.

It is unnecessary to remind ourselves that a positive blood Wassermann in a case with an obvious neurological lesion does not establish lues as the etiologic factor of the latter. It does establish a strong presumption in favor of such a conclusion. Final judgment must be based upon the history, clinical examination and complete laboratory findings. With all of them at our disposal, how frequently do we visit the autopsy room and later glance at the microscopical sections only to find our finest speculations contradicted.

Further, a report merely of a positive Wassermann is insufficient. One must know what antigens were employed and in what amounts the spinal fluid was used. Cholesterin antigens give 11 per cent more positive reactions in the blood than do simple alcoholic extracts of acetone insoluble lipoidal antigens.[20] In spinal fluids from all types of lues, 12 per cent more positive reactions are obtained with a cholesterin than with other antigens.[20] This result is observed more frequently in the cerebrospinal type of lesion than in others and is very frequent in treated cases.

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It is necessary to know in what amounts the spinal fluid is used for the complement fixation, because reactions that are negative with 1 c.c. or less of spinal fluid may be positive with larger amounts. A reaction should never be considered negative unless that result is obtained with the maximum amount (2 c.c.) of spinal fluid.

With 2 c.c. of spinal fluid a positive Wassermann may be detected in all types of luetic lesions in 7 per cent of cases that would otherwise be considered negative.[30] This difference is observed more frequently in tabes and tabo-paresis than in other types of lesions, and of course its value is especially to be considered in treated cases.

Except when treatment is contraindicated for other reasons a negative reaction should be striven for with 2 c.c. of spinal fluid and a cholesterin antigen before its discontinuance. Both of these procedures have been criticized as being too delicate and embodying a danger of getting false positives. Except in the hands of one with a thorough knowledge of serology, who controls each step of his reaction by preliminary titrations, the danger of false positives or non-specific reactions is great. In the blood such non-specific reactions, in the absence of due care, may be obtained in tuberculosis, carcinoma and pregnancy without luetic history or symptoms.

With proper technique such non-specific reactions rarely occur. This statement is based upon the study of over 10,000 blood Wassermann reactions and 600 spinal fluid examinations.

In no case does a negative Wassermann reaction in either blood or spinal fluid negate the presence of lues except together with other negative findings in the serology, history and physical examination. When lues is suspected in such cases, antispecific treatment with mercury or salvarsan should be instituted as a provocative measure.

Intravenous or subcutaneous treatment of a case of lues with negative serology may provoke a positive serology in both blood and spinal fluid; the converse is also true that intraspinal medication alone may provoke a positive Wassermann reaction in the blood as well as in the spinal fluid. Both of these have been observed in the series of cases upon which this study is based.

In advanced paresis the Wassermann is positive in both blood and spinal fluid in nearly 100 per cent of cases. Among 45 cases in which one or both reactions were performed, we have not observed a negative. Fordyce has recorded one case. Among 32 cases of very early paresis there was but one with a negative spinal fluid Wassermann. Three cases had a negative blood and positive fluid serology.

In our experience we have not encountered a negative spinal

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fluid Wassermann in tabo-paresis, but the blood serum may be negative in 33 1/3 per cent. In tabetic sera the Wassermann is positive in 57 per cent, and in fluid in 61 per cent. In cerebrospinal lues the Wassermann is positive in the sera in 82 per cent and in the fluid in 69.6 per cent. In lues of all types and stages, without nervous symptoms, the Wassermann is positive in the sera in 82 per cent and in the fluid in less than 1 per cent.

In conclusion we would urge the employment of every means at hand in order to correctly diagnose and classify syphilitic disease of the central nervous system. Many cases of neurasthenia and neurosis have syphilis for their etiology. This disease is one of the most important with which we as army surgeons must contend in this war.

Let us remember that paresis with its notable mental instability may arise early in the course of syphilis. The debilitating effects of syphilis, with the environment of life in army camps, may induce a break in a nervous system inherently defective, followed by the insanities. Unless we exercise vigilance, these individuals will not only become non-effectives, thereby depleting the ranks of our army, but become a menace to themselves and their comrades.

At all hospitals where the procedure can be practiced, the lumbar puncture is to be advised in all diseases of the central nervous system.

No report is complete without the five recognized serological tests. Reliance should not be placed upon any one alone.

A positive Wassermann only means syphilis, but does not tell the type. A negative Wassermann in the blood or spinal fluid or both does not mean that the patient may not have syphilis of the nervous system requiring treatment.

Mercury subcutaneously or intraspinally, and salvarsan intravaneously or intraspinally, may change a negative to a positive reaction. When this occurs the change is noted most frequently from the seventh to the tenth day.

No case of syphilis should be pronounced cured without a lumbar puncture.

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THE MIDCLAVICULAR AND MIDSTERNAL LINES AS LANDMARKS IN RECORDING CARDIAC OUTLINE. THE RELATION OF THE MIDSTERNAL AND MIDCLAVICULAR LINE AND THE SIZE OF THE HEART, WEIGHT AND CHEST CIRCUMFERENCE

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(With nine charts)

THERE are in use two methods of describing the extent of cardiac dulness: (1) Comparison of the left border of the heart with the left midclavicular line; (2) measuring the distance from the midsternal line to the left border of the heart. The expressions "mammary line" and "nipple line" are now taboo and should not be employed, as the nipple is not a fixed landmark and its position on the chest wall may vary greatly in different individuals. The use of the midclavicular line has been universal, but the question whether it is sufficiently fixed in its relation to the heart in normal persons has not been given much attention. As regards the midsternal line, it is a question whether measuring the extent of cardiac dullness from this line gives much information concerning the presence or absence of enlargement, unless the height, weight and chest measurements are also noted.

During our work with the Cardio-Vascular Board at Camp Jackson, we have been interested in collecting data from a group of normal individuals from various states, sent to the camp in the draft. Our studies had for their object the question of the distance of the midclavicular line from the midsternal line, the relation of the left border of the heart to the midclavicular line, and the relation of the midclavicular line and the left border of the heart to the individual's height, weight and chest measurement.

The questions to be answered are these:

1. Is the midclavicular line a satisfactory landmark for reference in outlining the heart?

2. Does the distance from the median line to the midclavicular line vary with the chest measurement, height and weight?

3. Does the distance from the median line to the left border of the heart vary with the physique of the individual?

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4. Does the recording of the left border of the heart in number of centimeters from the median line convey any idea, of itself, whether there is or is not enlargement, or must other factors be taken into consideration, such as chest measurement, height and weight?

A group of normal men (307) were studied, irrespective of their nativity (State), physique and color, the only demand being that they must be free of any appreciable physical defect. In other words, the men were young adults called in by the draft, passed by the local boards and accepted for military service by the special boards at Camp Jackson as normal individuals, without any ascertainable disease or deformity. These men were weighed, their height and chest were measured and, in addition, the distance from the midsternal to the midclavicular line was determined, the heart was percussed and the position of the left border expressed in centimeters distant from the median line. All methods were essentially clinical, such as are continually being employed by medical officers and physicians generally, and no corroboration of our percussion was made orthodiagraphically. Measurements were expressed in centimeters or one-half centimeter.

Before proceeding to the presentation of findings pertaining to the questions propounded above, it is interesting to exhibit the percentage of men of various heights, weights, and chest measurements in a fairly representative collection of 307 young adult males, born in the United States. The figures will bear out the general impression that the average American youth is of moderate build and development, although, in this series, only recruits from the Carolinas, Florida, Ohio, and Illinois were seen. In general the Western men were of better physique and appeared better nourished than were the Southerners.

The average man from our figures is between 67 and 68 inches, weighs 140 to 150 pounds and has a chest measurement of 34 to 35 inches.

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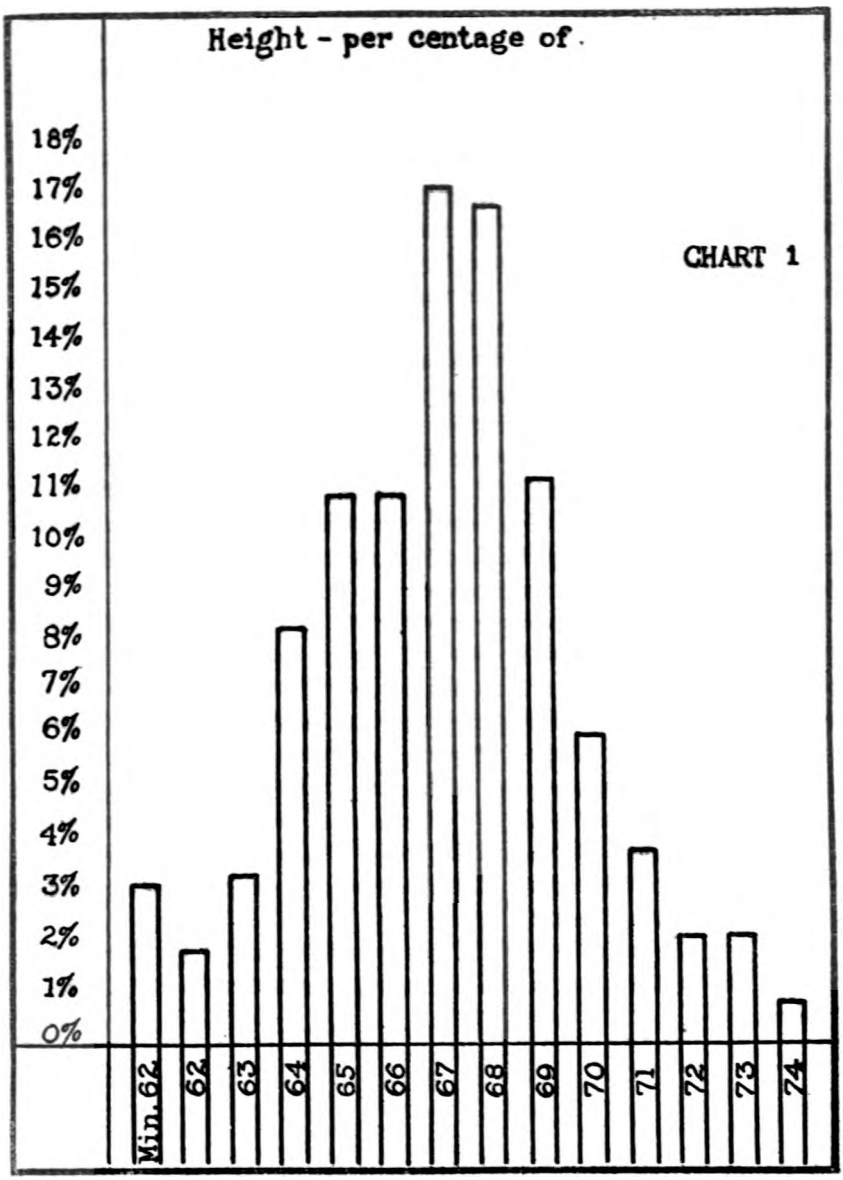

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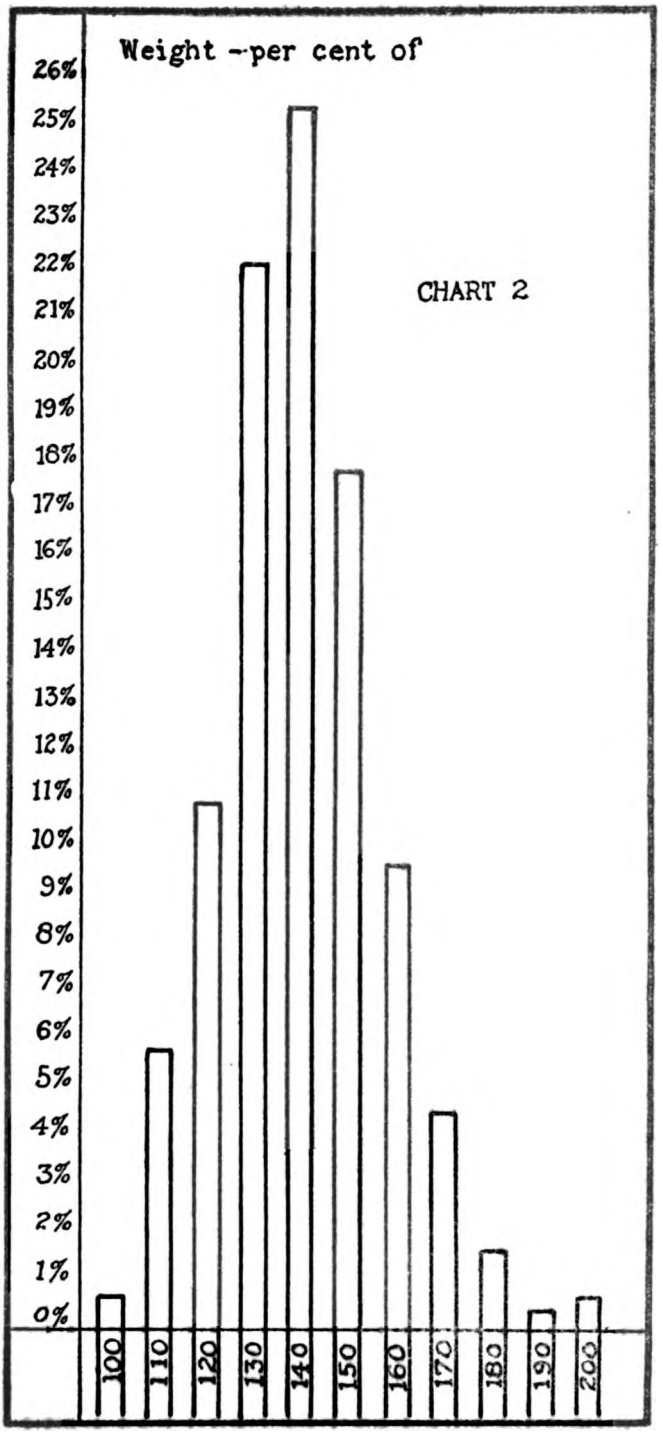

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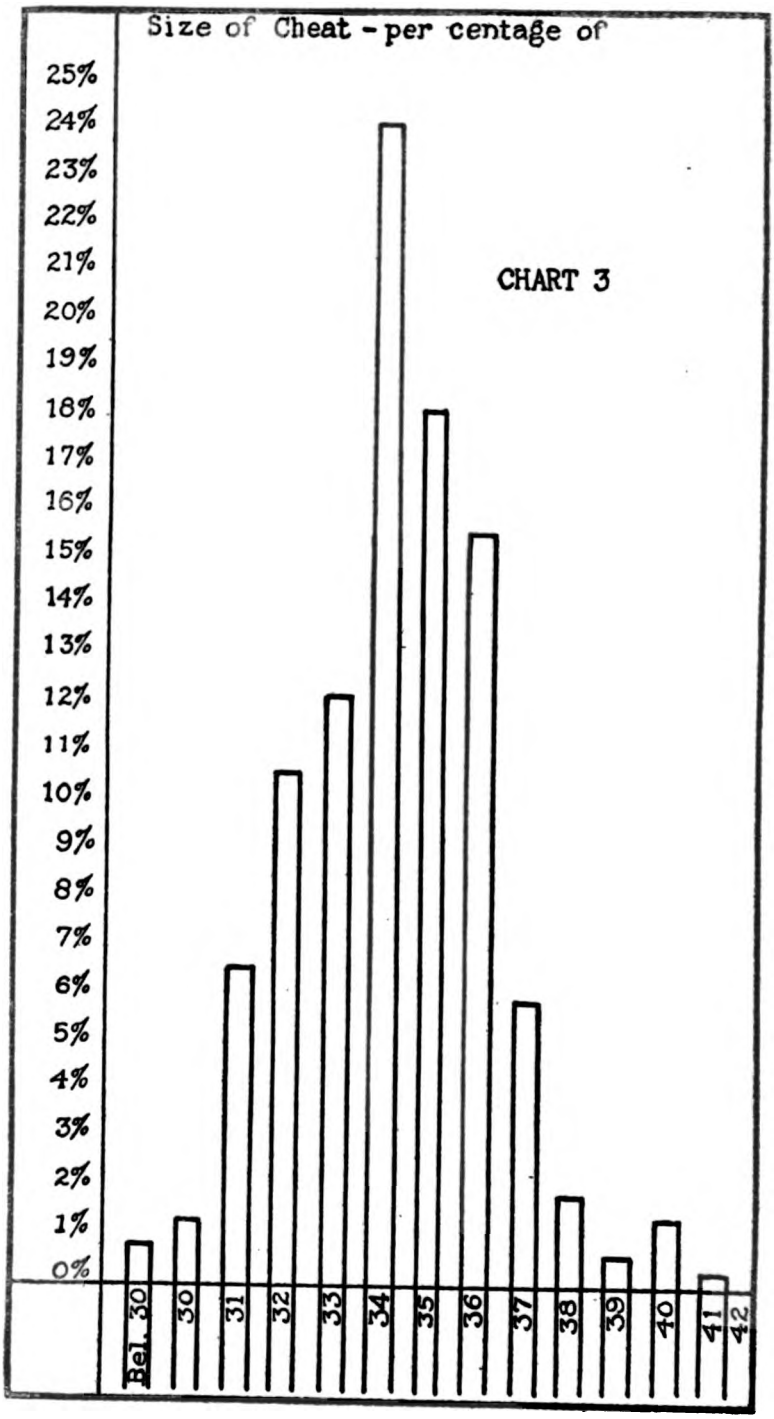

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The following charts need some explanation. Height and chest figures mean the unit and fraction thereof. The mean of the midclavicular line and the heart diameter was obtained by dividing the sum total of the measurements by the total number of men of such height. According to Chart 5 there are great differences apparently, but this table has been spaced in one-tenth centimeters, although it is not to be thought that our percussion detects as fine differences as lie between 9.50 and 9.40, or that we localize the heart border to 4/10 millimeter. In the high and low columns, the highest and lowest figure for any one height, for instance, is implied.

RELATION OF MIDCLAVICULAR LINE AND HEART TO HEIGHT

CHART 4.—*Height-Midclavicular Line-Heart*

Ht.	No.	Mean		High		Low	
		M. Cl.	Ht.	M. Cl.	Ht.	M. Cl.	Ht.
74	3	10.50	9.66	11.00	10.50	10.00	9.00
73	7	9.59	9.85	10.50	11.00	8.50	9.00
72	7	9.28	9.92	10.50	11.00	8.00	9.00
71	12	9.62	10.00	11.00	11.50	8.50	9.00
70	19	10.52	9.92	11.50	11.00	8.00	8.50
69	35	9.42	9.37	11.00	11.00	8.00	8.50
68	52	9.40	9.82	11.00	11.50	7.50	7.50
67	53	9.60	9.90	11.00	10.50	8.50	9.00
66	34	9.41	10.30	11.00	11.50	7.50	8.50
65	34	9.19	10.38	10.00	11.00	8.00	8.00
64	26	8.98	9.61	11.00	10.00	7.50	8.00
63	11	9.04	9.25	10.50	11.00	7.50	7.50
62	6	9.40	9.58	10.00		8.00	9.00
Bel. 62	8	9.50	9.93	10.00	10.50	9.00	9.00
Total....	307						

It will be seen from Charts 4 and 5 that the position of the midclavicular line on the chest wall varies disproportionately with the height. Nor is the left border of the heart a fixed quantity, nor does it vary proportionately with the height. Thus a man of 5 feet 5 inches may have a heart 0.7 cm. larger than the man of 6 feet 2 inches. The largest hearts were seen in the men of 65 to 66 inches, and in these individuals the left border was over 1 cm. outside the left midclavicular line. As a matter of fact, in only two instances was the left border within the midclavicular line, namely, in the men of 69 and 74 inches. Obviously this line is not a safe landmark, and equally obvious is the observation that no standard of

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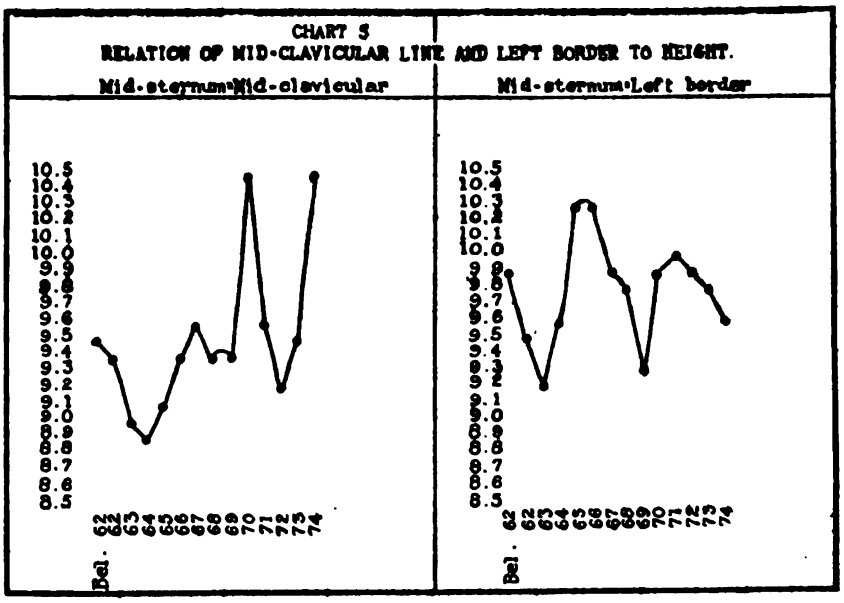

comparison between the height and cardiac outline can be made. The only possible deduction is that irrespective of height and the midclavicular line, the distance of the left border from the median line is the only fair criterion, and, from our figures, this distance is 9 to 10.5 cm.

RELATION OF MIDCLAVICULAR LINE AND HEART TO WEIGHT

CHART 6.—*Weight-Midclavicular Line-Heart*

Wt.	No.	Mean		High		Low	
		M. Cl.	Ht.	M. Cl.	Ht.	M. Cl.	Ht.
200–209	2	10.75	10.25	11.00	11.00	10.50	9.50
190–199	1	10.00	11.00	10.00	11.00	10.00	11.00
180–189	5	9.60	10.00	10.00	11.50	9.50	9.00
170–179	14	9.60	10.43	10.50	11.00	9.00	8.50
160–169	30	10.10	10.15	11.50	11.00	9.00	9.50
150–159	55	9.69	9.50	11.00	11.00	8.00	8.00
140–149	78	9.32	9.77	11.00	11.00	7.50	7.50
130–189	68	9.10	9.59	11.00	11.00	7.50	8.50
120–129	34	9.05	9.45	11.00	11.50	7.50	7.50
110–119	18	8.45	9.00	9.50	10.00	7.50	8.00
Bel. 110	2	7.7	8.25	8.00	9.00	7.50	7.50
Total	307						

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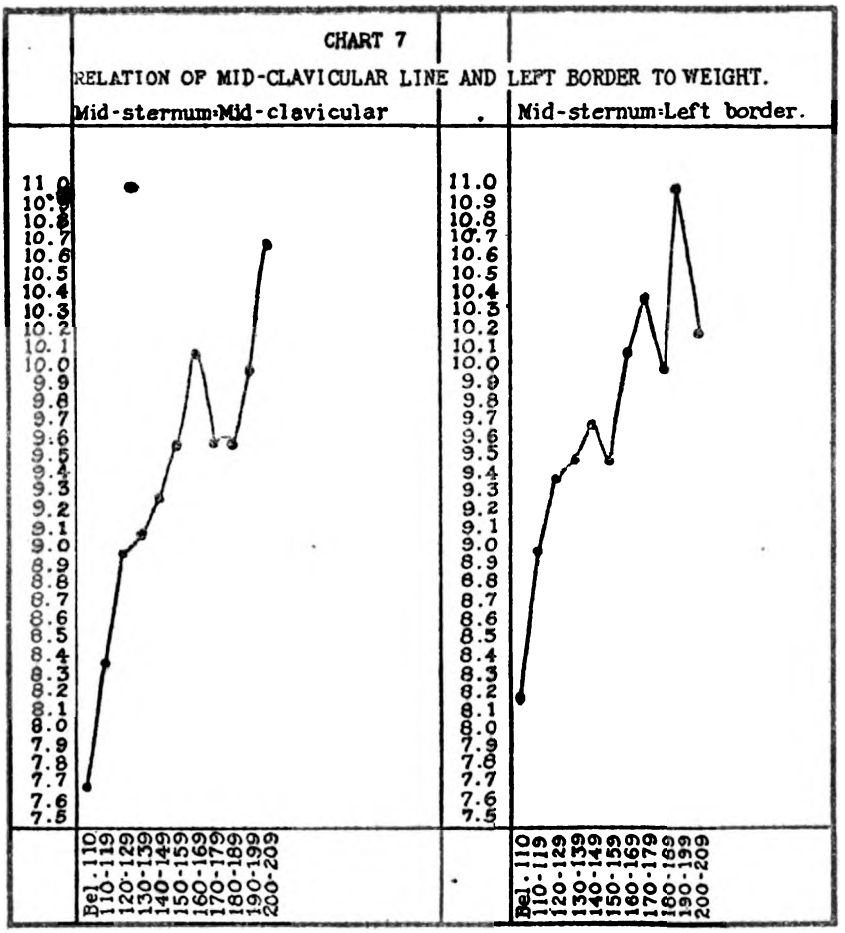

Lewis has found that the heart's diameter varies in healthy people in direct ratio with the body weight (orthodiagraph). In our series, the midclavicular line is variable and also the size of the heart, but the left border in all but three instances (in the men of 150 to 159, 160 to 169, 200 to 209 pounds) was beyond the left midclavicular line, sometimes as far out as 1 cm. The objections to the use of this line obtain here as well as in the foregoing (Charts 4, 5), and if it is remembered that the size of the heart varies with the weight of the individual, the median-line measurement is the only accurate one.

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RELATION OF THE MIDCLAVICULAR LINE AND HEART TO CHEST MEASUREMENT

CHART 8.—*Chest-Midclavicular Line-Heart*

Chest	No.	Mean		High		Low	
		M. Cl.	Ht.	M. Cl.	Ht.	M. Cl.	Ht.
41	1	10.50	11.00	10.50	11.00	10.50	11.00
40	4	10.50	10.62	11.00	11.00	9.50	9.50
39	2	9.50	11.25	9.50	11.50	9.50	11.00
38	6	10.08	10.16	11.50	11.00	9.50	9.00
37	18	10.11	10.44	11.00	11.50	9.00	8.50
36	48	9.91	10.19	11.00	11.00	8.50	9.00
35	56	9.72	10.15	11.00	11.00	8.50	9.00
34	74	9.38	10.36	10.50	11.50	8.00	9.00
33	38	9.10	9.56	10.00	10.50	7.50	8.50
32	33	8.56	9.07	10.00	10.00	7.50	8.50
31	20	8.32	8.92	9.50	10.00	7.50	7.50
30	4	8.75	9.00	9.50	9.00	8.50	9.00
Bel. 30	3	7.66	8.33	8.00	8.50	7.50	8.00
Total..	307						

These charts have a close resemblance to Charts 6 and 7, but show a more regular upward tendency. In all instances the left border was outside the midclavicular line, affording a third argument in favor of discontinuing reference to this landmark. We believe that the heart increases proportionately to the size of the chest as well as to weight, which is tantamount to saying that of two men of equal height, the heavier will have the larger chest and naturally will have the larger heart.

From a study of these measurements, we conclude that:

1. The size of the heart has no direct relation to the height.

2. The size of the heart varies fairly uniformly with the weight and chest measurement of the individual.

3. The distance from the midsternum to the midclavicular line varies with the chest measurement, weight and height.

4. The midclavicular line is an unreliable landmark.

5. The size of the heart (the distance from the median line to the left border of the heart) varies with the individual's physique—disproportionately to the height, and proportionately to the weight and chest measurement.

6. Measurement of the heart bounday from the median line is

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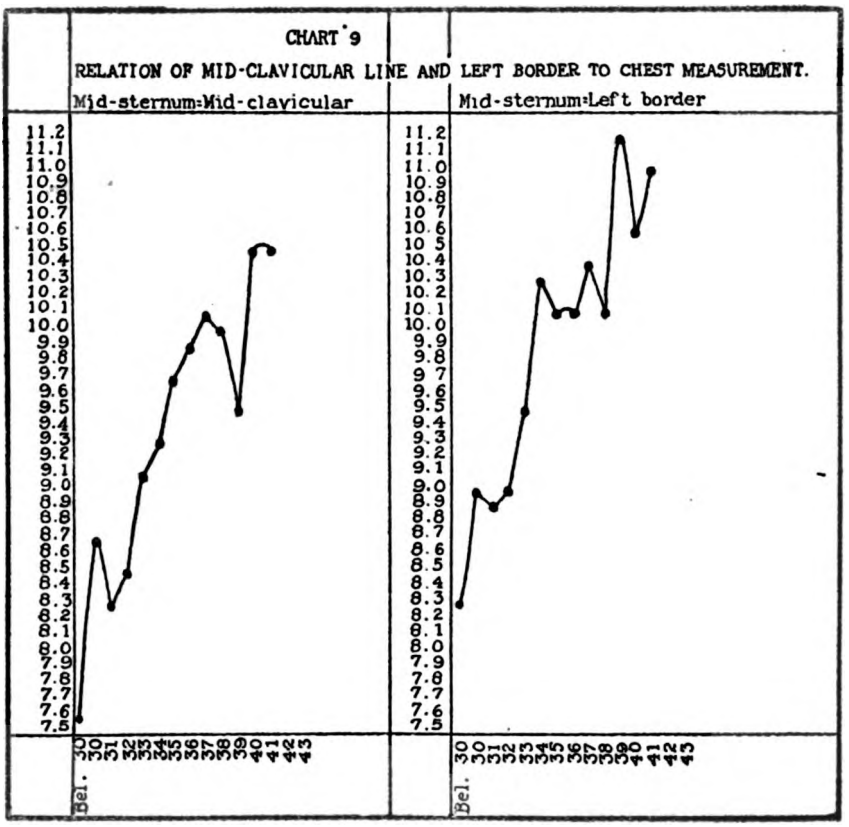

the only reliable clinical method, but, to interpret these figures properly, data should be furnished as to weight and circumference of chest.

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EMPYEMA—SOME OBSERVATIONS MADE IN THE FLUOROSCOPIC STUDY OF A SERIES OF SIXTY-FOUR CASES

By Captain CHARLES H. NIMS
Medical Corps, United States Army

(With six illustrations)

THE prevalence of pneumonia in the army during the past winter has given unusual opportunity for the observation of the many cases of associated empyema. In consulting the literature and meeting with many members of the profession it has been borne in upon us that the knowledge of empyema, to say the least, has been incomplete. In fact, to the average practitioner of medicine the presence of empyema as a complication of pneumonia has been *terra incognita.* In this comparatively brief report it is the desire to present to the profession two of the most salient points which have been brought out during the roentgenological examination of some seventy-five cases.

Point number one is this: That free collections of pus in the pleural cavity are usually preceded by small collections between the lobes.

Point number two is that the fluoroscope is the instrument of precision, *par excellence,* in locating small collections of pus in or about the lungs.

Perhaps it would be well to trace the sequence of the observations that led us to these conclusions. We do not wish it understood that we claim special orginality in calling attention to these small interlobar collections of pus. We would try, however, to lay stress upon the ease of the early fluoroscopic detection and localization of these pockets. It is probable that in studying these cases the roentgenologist has placed too much dependence on the radiographic plate, and that this fact has led observers to state in a desultory sort of way that the "X-ray is sometimes of assistance in locating these small collections between the lobes." Be that as it may, the trend of our thought was about as follows:

Multiple Collections.—Our attention was first directed to a series of cases of which Fig. 1 is a type. In these cases an area of density about the size of the palm of one's hand, in the middle of the upper

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pulmonic field (of uniformly lesser density), led to the subsequently confirmed diagnosis of pus in the incisura.

It was immediately noted that in many of these cases clear fluid could be aspirated at the same time from the free pleural cavity, thus indicating that the original location of the infection was between the lobes. This condition was observed in several similar cases.

Incisural Type.—Our attention was next directed to a number of cases of which Fig. 2, Case 527, is typical. This plate was taken within forty-eight hours after the crisis of a typical pneumonia of the upper lobe. The exudate into the incisura in this case was absorbed. In some of the cases the suppuration went on to the formation of a localized collection which our surgeons learned to drain before it had ruptured into the free pleural cavity. By a series of observations of this nature we began to regard the early collection of fluid in the incisura as the ordinary sequence in many cases of pneumonia. Our surgical staff began to handle them much in the same way as we handle a localized appendicular abscess and tried to approach them through the line of adhesion to the chest wall over the incisura, instead of methodically opening in the old point of election low down in the back.

At this stage we had recourse to our anatomy and we studied as never before the divisions of the lobes, and more particularly the incisurae, or spaces between the lobes. When we had become fairly familiar with the exact position of the incisurae on both right and left sides, we learned that by slightly rolling the patient under the fluoroscope we could readily observe that the dense shadow in the middle of the pulmonic field did not represent a globular collection of pus, but that in the lateral view the shadow was more of a linear nature, indicating a thin sheet of fluid between the lobes. It is easy to see how difficult it would be to strike such a collection with the needle. Often the changing of the position of the point of the needle a small fraction of an inch determines the finding of pus. It was this fact that led us to determine as accurately as possible with the fluoroscope the point where the pus approached most nearly to the chest wall, and to indelibly mark this point for the guidance of the surgeon.

The thinness of this sheet of pus may possibly furnish to the operator an explanation of past failures; for instance, a case has been referred for operation after a competent internist has aspirated pus and where the surgeon, aspirating before resecting,

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fails to find the pocket with the needle and puts off the operation, often casting doubt upon the accuracy of the report made by the internist.

Paravertebral Type.—So far had we gone with the study of what we may call the incisural cases, when we encountered a few, of which Case 962, Fig. 3, is typical. Here we again had recourse to our friend Gray of anatomical fame. We observed carefully the long, narrow space along the vertebral column on the right, continuous below with a space between the right pericardium and pleura. On the left we noted a similar space, and we also noted the difference due to the position of the heart.

Referring now to Fig. 3 note the shadow extending up along the vertebra on the right side. This gave us considerable trouble at first and led to the suspicion of pericardial effusion. However, we soon came to recognize this as a collection of pus in the posterior pleura along the bodies of the vertebrae. We call this the paravertebral type.

Peripheral Type.—Little need be said of the accepted type of empyema characterized by a considerable collection of fluid in the free pleural cavity. This is shown in Fig. 4; we call this the peripheral type.

For convenience, then, we classify our cases of empyema as *incisural, paravertebral,* and *peripheral.* This has served very well as a classification, though, as above indicated, there are many cases which are difficult to place. Working on this basis we have attempted to tabulate fairly some sixty-four cases of which sufficient data in the way of fluoroscopic records and radioscopic plates have been obtained. Most of the cases were seen and plated several times, and many were seen after recovery, when the only sign of the old trouble would be lagging of the diaphragm on the affected side and the location of the resection. Many cases seen once or twice were discarded on account of insufficient data.[2]

You will note that of the cases forty-three were classed as incisural and only five as paravertebral. The rest were, at the time of the first examination, so far advanced as to have to be classed as peripheral, or were so at the beginning. Personally, the writer believes that as observations are made earlier in these cases the per-

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[2]The writer included a table of sixty-four cases of pneumonia, showing thirty-five of right and twenty-nine of left lung. Of these, forty-three were of incisural type, five were paravertebral and sixteen peripheral. Of thirty-two cases, of which the type of pneumonia was given, twenty-one were lobar, ten bronchial and one broncho-lobar. Of twenty-four cases in which the type of germ was given, six were I, four were II, eleven were IV, and three were streptococcus hemolyticus.

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centage of peripheral cases will fall to a very low point, much as the ratio of cases of general peritonitis has fallen by early surgical intervention in localized appendicitis.

Without going into the matter from the point of the bacteriologist, it is necessary to state that much light is cast on the proper interpretation of the fluoroscopic image if the type of infection is known. Cases due to infection with streptococcus hemolyticus are much more difficult of interpretation than are those with the standard types of pneumococcus, and more fatal. This is easily explained by the nature of the infection which tends to complicate the formation of pus with a diffuse cellulitis of all neighboring structures.

Method of Fluoroscopic Examinations.—Just a few words as to the method of fluoroscopic examination in these cases. You will note that the word "fluoroscopic" is used advisedly. The radiograph is very valuable as a record of cases and for comparison, but it sinks into insignificance beside the view of the living body as seen on the screen.

The patient is first examined supine. The facts are noted which have the most important bearing on the diagnosis.

First: Is one side of the diaphragm fixed? If one side of the diaphragm is seen to be moving much more than normally while the other side is fixed, attention is at once directed to the immobile side as the one affected. Incidentally, the character of the motion of the diaphragm on the unaffected side has a marked bearing on the urgency of the case.

Second: Is the heart shadow crowded into the clear pulmonic field? The amount of displacement of the heart shadow is a very accurate measure of the amount of fluid present. Here it is well to note that the longer the fluid has been present the more the chest has accommodated itself to the condition and the less will the heart be crowded over with the same amount of fluid.

Third: Is the area under suspicion more or less dense than the heart shadow? Careful observation of this point, balanced with the amount of displacement of the heart shadow, gives a very fair index as to the density of the fluid. It is well, in observing a heart shadow, to note carefully just how distinct are the ribs through the shadow. If the shadow is very much lighter than that of the heart, and the latter is not displaced, fluid can be ruled out.

Lateral Observation.—After having learned all that can be deduced by the method indicated, the screen should be raised suffi-

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ciently to enable one to roll the patient slightly from side to side. It is not necessary to roll him to any great extent before one can readily determine the nature of the density on the affected side. First, by turning the patient gently toward the unaffected side the posterior region can be well observed. By a reversal of the process one can note the condition in the anterior part of the chest. The careful use of this method cannot be too strongly emphasized, for by this means only can the location of pus be determined in its antero-posterior relations. In a large clinic one will be surprised to see how often the density which indicates the presence of pus in the middle of the pulmonic field resolves in a lateral view into an oblique shadow, indicating a thin sheet of fluid in the incisura, of which we have spoken before. We have been unable to show this clearly in a plate on account of the condition of the patients and the difficulty of getting the exact angle. Careful practice with the fluoroscope in these cases will readily demonstrate what little evidence of the extent or position of a thin sheet of fluid between the lobes can be gathered from the usual frontal view.

The stress of army work has prevented more than this brief, and possibly superficial, recital of conclusions checked and rechecked at every point by the kind assistance of the able corps of men located here. Many small items that have been mentioned in a sentence are the result of conclusions drawn after days of friendly wrangling over a set of confusing cases. It is hoped that enough has been said to attract the attention of other men having cases of this sort to this method of examination, as well as to direct their especial attention to the detection of small sheets of fluid showing clearly only in the lateral position.

Figs. 5 and 6 are inserted only as being of interest in connection with Fig. 3, paravertebral type.

Fig. 5 is a radiograph of the same case as Fig. 3, taken a week after operation, showing effect of removal of the fluid.

Fig. 6 is a case of purulent pericarditis and is shown simply to throw light on the question of differential diagnosis.

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SOME SUGGESTED IMPROVEMENTS IN METHODS OF PETROLIZATION OF MOSQUITO BREEDING AREAS

By Surgeon W. L. MANN and Assistant Surgeon E. C. EBERT, U. S. Navy

(With three illustrations)

THE location of Marine Barracks, Quantico, Va., in vicinity to the marshes adjacent to the Potomac River, rendered it desirable that some original investigations be undertaken in an attempt to improve the former methods of petrolization. In an endeavor to secure more satisfactory results at mosquito control, experiments were made by Assistant Surgeon E. C. Ebert, under direction of the Post Surgeon, with various substances impregnated with oil. These substances were soaked in oil and the same were tested as to the degree of liberation of this oil. Such substances as cotton waste, bricks, cinders, and sand were tried out with only a fair degree of success. Finally, oil-soaked sawdust was experimented with, and it gives indications of providing a satisfactory method of securing an equal distribution of oil.

The loose, dry sawdust is soaked in oil for a period of 24 hours and the same is carried about in buckets and distributed on the surface of the mosquito-breeding areas by hand. In certain marshy places, where floatage and other conditions cause the same to be inaccessible, it was found that this oiled sawdust may be tied in paper bags and the bags thrown at random into the floatage. The oil-impregnated sawdust is held by the weeds and floats on the surface, each individual particle becoming a means of slowly liberating the petroleum.

When oiled sawdust is applied to running streams its flow down stream should be retarded by placing a floating boom across the stream at intervals of 50 to 100 feet. These booms are made of slats of wood 1 foot by 2 feet, the length depending upon width of stream. Both ends of the boom are anchored to the shore with a cord about one foot long so as to allow for the rise and fall of water. The boom should be made in the form of an angle with the apex pointing down the stream. In this way the sawdust has a tendency to accumulate in the angle of the boom. By allowing a 1-inch gap in the apex, it courses down the stream to the next boom where it is again retarded.

Our experience during the previous season with the use of oil drip cans on running streams demonstrated that the number of drops of oil per minute varied with the variation in temperature, and, moreover, they require more or less attention.

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As a substitute for the drippers, two methods are now employed (*a*) the oil-soaked sawdust cage, and (*b*) the automatic oil bubbler.

(*a*) The oil-soaked sawdust cage, or box, is imbedded in the small, running streams. These boxes should be placed so that only one-eighth to one-fourth of the box is submerged. The portion that is not submerged will force some of the oil out of the box by pressure. The sides and bottom of the boxes should be perforated to allow the oil to pass out of the box and flow down the stream. These cages, or boxes, should be placed at the source of streams and a few cups of oil added occasionally, thereby keeping the sawdust well saturated with oil. The length of time during which the cage is efficient without renewal of oil varies, of course, with the relative volume of the stream and the size of the sawdust cage. In some instances this device was found to be effective without renewal of oil for a period of two to three weeks, liberating a fine film of oil.

(*b*) Instead of having the oil drop from above, downwards, upon the surface of the stream, the automatic oil bubbler was devised so as to permit it to be completely submerged, thus allowing the oil to come from below, upwards.

The construction of these automatic submersible oilers is simple and is based on the principle that the specific gravity of oil is lower than that of water. By constructing a submersible can, with the addition of an iron weight attached to the bottom, so as to counteract the low specific gravity of oil, it was possible to keep the oil-filled can submerged and on the bottom of a stream or pond.

The capacity of the can may be of any desired amount, but experience has proved that cans with a capacity of 2 to 5 gallons are desirable because these can be easily handled and manipulated and so regulated that the flow will continue from four to ten days. While larger cans will hold more oil and flow longer, yet it is desirable to have more units and cover a greater area.

The submersible automatic bubbler should be constructed of galvanized sheet metal or light iron, with a watertight soldered top.

The details of construction of the oiler are shown in Figs. 1 and 2. Two spigots are attached to the top of the oiler. One serves as an oil outlet, while the other serves as a water inlet. The spigot that serves as a water inlet has a ½ to 1-inch pipe attached and extending almost to the bottom of the bubbler. It is the difference in weight of a column of water in this pipe and an equal length column of oil that causes the flow of oil which is replaced by water. A third spigot may be attached on the side, and is used to empty the can after the water has replaced the oil.

A float is attached so as to indicate the location of the bubbler. The

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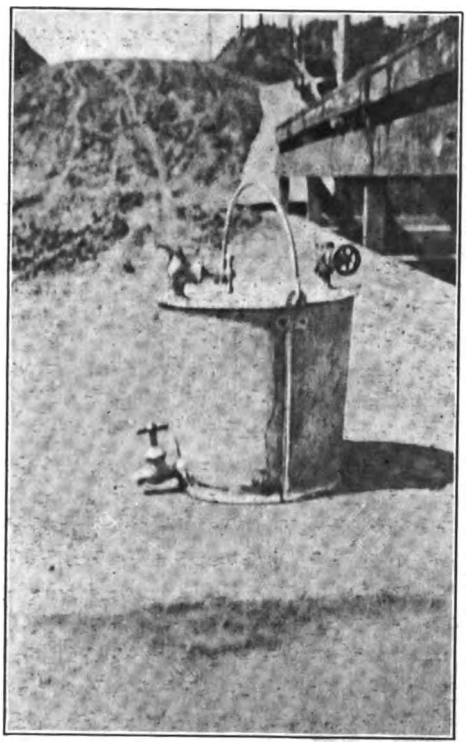
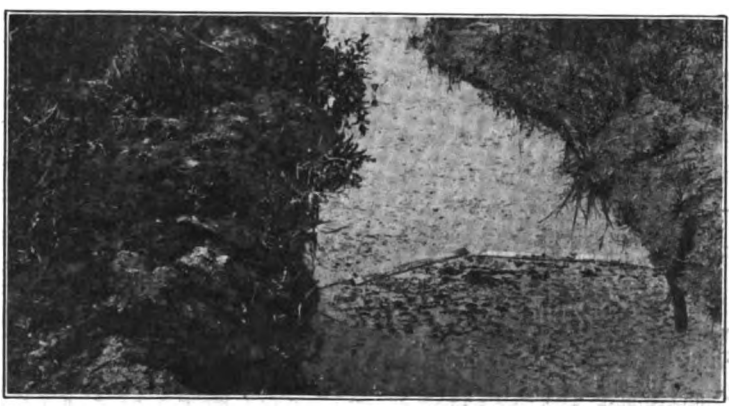


SUBMERSIBLE AUTOMATIC OILER



SAWDUST BOOM

(To face page 544.)

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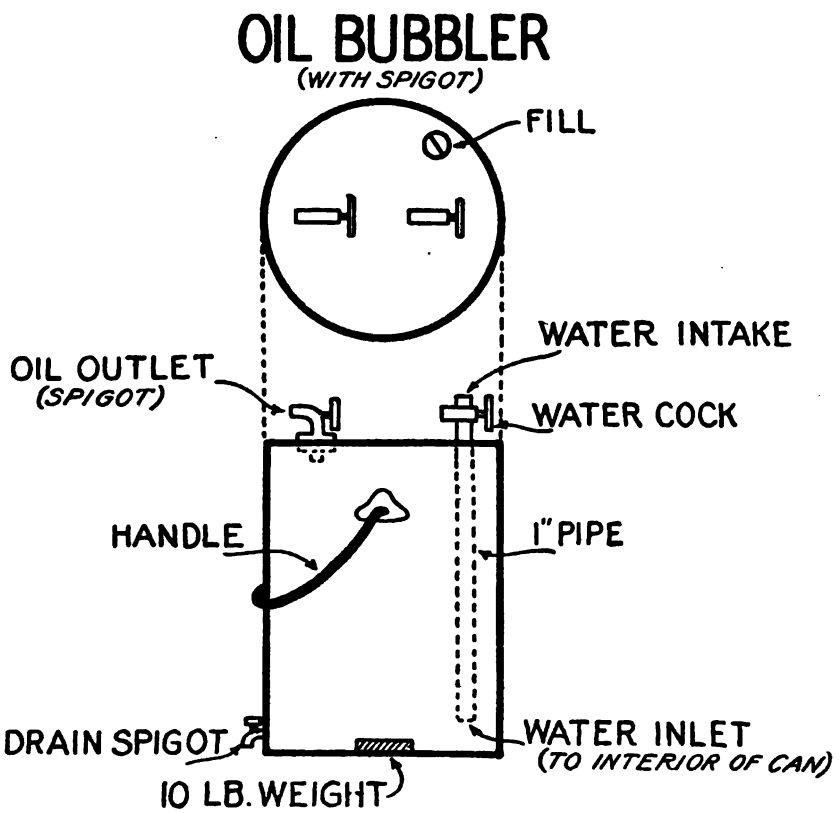
flow of oil should be so regulated that five to forty bubbles are given off per minute. A slower flow does not form a film sufficient to cover an area of any size, while too rapid a flow will cause too great an accumulation of oil in one area and does not spread properly.

The advantages of the above methods are as follows:

(*a*) A change of temperature is less likely to alter the rate of flow of oil; (*b*) the film of oil appears to be more constant and tends to spread more uniformly; (*c*) the oil bubbler may be submerged in marshy areas; (*d*) it requires less attention; (*e*) simplicity of construction.



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DEMONSTRATION OF D. MENINGITIDIS IN THE ADENOID TISSUE OF THE NASOPHARYNX

By Capt. J. D. ARONSON and Major S. A. FRIEDBERG, M. C., U. S. A.
Base Hospital, Camp Doniphan, Fort Sill, Okla.

AN investigation of an epidemic of cerebrospinal meningitis revealed so many points of interest that, in the opinion of the writers, a detailed report of the findings is warranted.

During the months of November and December, 1917, January and February, 1918, a small epidemic of meningitis developed amongst the troops stationed at Camp Doniphan, Fort Sill, Okla. The first five cases occurred in the 110th Ammunition Train within a period of fourteen days. A second focus of the disease manifested itself about three weeks later in the 137th Infantry, an organization located about one and one-half miles from the Ammunition Train. Careful investigation showed that the development of this second focus could be attributed to the frequent visiting of the noncommissioned officers of the Ammunition Train to the 137th Infantry, the organization to which they were originally attached.

A consideration of the above circumstances led to the conclusion that the dissemination of the disease was probably due to the presence of a carrier or carriers in the Ammunition Train, and a systematic study was undertaken to determine the fact.

Following suggestions made by Drs. Jordan and Mathers, the men of the caisson in which two cases of meningitis had but recently occurred were cultured. The cultures were obtained from the nasopharynx by means of a sterile swab placed upon a wire, which was bent at an angle of about 45 degrees. This was introduced through the mouth and passed backwards and upwards into the nasopharynx, care being taken not to touch the tongue or fauces with the swab. Plates of horse-blood agar were then inoculated from these swabs and the plates streaked by means of a platinum wire.

The inoculated plates were incubated for twenty-four hours at 37° C. and suspicious colonies were picked and stained by Gram's method. Colonies which showed the presence of Gram-negative diplococci were transplanted to tubes of horse-blood agar and after twenty-four hours incubation were emulsified in normal salt solution and macroscopic agglutination carried out, using a polyvalent anti-meningococcus serum for that purpose.

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The caisson cultured consisted of 126 men, and of this number five were found to harbor the meningococcus in the nasopharynx. Of the five found positive, three were found in one tent, while the remaining two were found to be quartered in adjacent tents. The following questionnaire was then prepared and data obtained from meningitis cases upon their admission to the base hospital and from carriers and contacts in the field.

BASE HOSPITAL, CAMP DONIPHAN, FORT SILL, OKLA.

1918

Name.....Color.....Nativity.....
Age.....Organization.....Date of joining.....
Previous organization.....Date of joining.....Date when taken sick.....
Date admitted to the hospital.....Symptoms.....
Previous cases in same organization and date of occurrence.....
Proximity to any previous case.....Location of tent.....
No. of squad.....No. of platoon.....
Messing arrangement.....Sleeping arrangement.....
Drilling arrangement.....Fomites used in common.....
Names and address of friends.....
.....
Names and address of friends in common with previous case of meningitis.....
.....
Condition of nasopharynx.....Home address.....
Date when last home.....Cases of meningitis in home town.....
Proximity to cases in home town.....Laboratory results.....
Spinal fluid.....Nasopharynx.....

As a result of a study of these questionnaires it was found that Pvt. R. (one of the carriers found on January 4, 1918) was a friend in common of the following men who developed meningitis on the dates indicated: Pvt. R. V., November 6, 1917, Pvt. C. C. November 9, 1917, Pvt. B. C., November 13, 1917 (in the same drill squad), Pvt. A. C., November 20, 1917 (quartered in a nearby tent). While this study was being made, Pvt. H. F. developed meningitis on December 24, 1917, and it was found that he was a tent-mate of Pvt. R. It was at this time that the entire caisson was cultured, with the result that Pvt. R. and two of his tent-mates were found to be meningococcus carriers.

In view of the foregoing findings it was considered probable that Pvt. R. was the source of the meningococcus infection. This was further borne out by the fact that, following his removal from his organization

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on January 6, 1918, no new cases appeared until February 1, 1918, at which time the last case that occurred in this organization developed.

The following data have been collected as a result of our studies:

Pvt. R. R., aged 23, white, farmer by occupation. Now attached to Caisson F, 110th Ammunition Train. Previous Medical History: Had measles at age of eleven, and pleurisy at twenty-two. His health had otherwise been good, with the exception that he has always been subject to catarrhal affections of the respiratory tract. Family History: Negative. Personal History: He was born at Carthage, Mo., in 1894, where he attended public school until he was sixteen. In 1900 he went to Butler, Mo., where he remained until 1906 when he removed to Garden City, Kansas. From 1912 to 1914 he worked on a farm at Fort Collins, Col. He returned to Garden City in 1914, where he remained until he was drafted into the army on September 18, 1917.

During his stay at Fort Collins, Col., he made the acquaintance of a family which he visited frequently. About one month after his first visit two children in this family developed meningitis and died. These are the only cases of the disease of which he has knowledge, prior to his entry into the service.

In September, 1917, he was sent to Camp Funston, Kans., where he was assigned to Co. I. 353d Infantry. While there he was quartered in a barrack with about 150 to 200 men. According to statements made by comrades who were quartered with h'm, cases of meningitis developed in his barrack as well as in some of the adjoining barracks.

Present History: He was transferred to Caisson F, 110th Ammunition Train, stationed at Camp Doniphan, on October 18, 1917. About two weeks after his arrival he complained of weakness in his legs, backache, anorexia, tinnitus aurium in the left ear and pain radiating from his neck to his head. This headache was increased by lateral movement of the head. The backache was relieved by medication, but the headache was persistent. After about three weeks the symptoms disappeared, with the exception of the tinnitus. The regimental surgeon did not consider his condition serious enough to transfer him to the base hospital nor to keep him in quarters. From the foregoing symptoms one would hardly be justified in the belief that Pvt. R. suffered from an attack of meningitis which resulted in his becoming a persistent carrier.

Physical examination: General inspection showed a fairly well-developed male weighing about 140 pounds and measuring 67 inches. His facial expression was rather dull and apathetic. Examination of the chest, abdomen and extremities revealed nothing abnormal. Upon examination, the right naris was found to be free, but the left was obstructed by a deflection of the septum which reduced the size of the passage to about one-third of the normal. The tonsils were moderate in size, submerged, and pus was forced out on pressure. The nasopharynx showed the presence of a small amount of adenoid tissue. There was no pus in the nose or nasopharynx nor was there any other clinical evidence of accessory sinus disease. With the exception of a retraction of the left drum membrane nothing abnormal was found in the ears. Roentgenographic examination of the sinuses was negative.

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A culture taken from the nasopharynx on January 4, 1918, according to the method described above, yielded a pure growth of meningococcus, which was agglutinated by polyvalent anti-meningococcus serum in a dilution of 1:400, which was the highest serum dilution used in that test. He was transferred to the isolation camp, where local treatment was instituted. Dichloramine-T in paraffine oil and oil of eucalyptol was applied to the nasopharynx and, later, local applications of silver nitrate were made. Cultures taken from the nasopharynx on January 10, 14, 19, 22 and 26 were negative but became positive on January 28, February 2, and February 5. Cultures were again negative on February 9, 13, 17, 20, and 27, and again positive on March 2, 1918. On March 6, he was transferred to the base hospital. A culture from the nasopharynx the next day was found positive.

On March 8 the tonsils and adenoids were removed under local anesthesia. Examination of the tonsils after removal showed them to be somewhat hypertrophied, with distinctly enlarged crypts from which pus could be expressed. No meningococci were found in cultures made from the tonsils.

Several small masses of adenoid tissue measuring about 1.5 cm. in diameter were fixed in Zenker's solution embedded in paraffine, sectioned and stained with eosin methylene blue and by Gram's method. Microscopic examinations of the sections of adenoid tissue revealed masses of bacteria upon the free surface of the tissue and small scattered clumps of bacteria throughout the cortex. Upon the free surface were noted areas of superficial ulceration located about the masses of bacteria and numerous newly formed blood vessels were seen at the periphery of the ulcerated areas. The capsule and the trabeculae were thickened. Tissue surrounding the masses of bacteria deeper in the structure stained uniformly pale and did not show any evidence of inflammatory reaction. Under higher magnification the masses of bacteria were found to be Gram-negative diplococci with flattened approximating surfaces, resembling, morphologically and in their staining reactions, the meningococcus.

Following the removal of the tonsils and adenoids, no local treatment was instituted, so that the result of the operation could be properly controlled.

The result of post operative cultures was positive from March 12 to March 30 with two exceptions and thereafter negative. All cultures were made upon horse-blood agar, using six plates at each examination.

A study of the nasopharynx on several occasions following the operation, while positive cultures were still being found, showed an unhealed surface covered by a muco-purulent secretion. The complete

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healing of this area was followed by constantly negative cultures. After 24 hours incubation at 37°C., the cultures obtained from the nasopharynx planted upon defribrinated horse-blood agar showed discrete and confluent colonies. The colonies varied in size from 1 to 3 mm. in diameter. They were elevated, moist, round and opalescent in the center, while the margins were clear. The margin of the colony was regular in its outline and sharply limited. After 48 hours incubation the tendency of the colonies to become more confluent and opaque was noted. Microscopic examination of the culture showed them to be Gram-negative diplococci with the morphology of the meningococcus. The organisms showed distinct variation in size and in staining reaction, this being especially marked in 48-hour-old cultures.

Agglutination of the organism was carried out using serum obtained from Pvt. R., anti-meningococcus serum No. 1, No. 10, No. 30, No. 60 from the Rockefeller Institute and polyvalent anti-meningococcus serum. Control tubes were set up, using normal horse serum and normal salt solution. The serum was so diluted that the desired dilution was present in 0.8 c.c. of salt solution, and to each tube of diluted serum was then added 0.2 c.c. of an emulsion of a 24-hour-old culture obtained from the nasopharynx of Pvt. R. The tubes were well shaken, placed in an incubator at a temperatureof 55° C. overnight and readings made the next morning.

The results of the macroscopic agglutinations are here tabulated:

	Sera					Controls		
Dilution	Pvt. R. R..	No. 1	No.10	No.30	No.60	Polyvalent	Nor. Serum	Salt Sol.
1:10	X	X	X	—	—	X	—	
1:20	X	X	X	—	—	X	—	
1:40	X	X	X	—	—	X	—	
1:80	X	X	X	—	—	X	—	
1:160	X	X	X	—	—	X	—	
1:320	X	X	X	—	—	X	—	
1:640	X	X	X	—	—	X	—	
1:1280	X	—	X	—	—	X	—	
1:2560	X	—	S	—	—	X	—	
1:5120	X	—	D	—	—	S	—	

X—Positive. S—Slight agglutination. D—Doubtful agglutination.

SUMMARY

1. History of cases of meningitis in a community where Pvt. R. resided.

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2. Sudden outbreak of meningitis in the organization to which he was attached.

3. Close association with four out of a total of six cases of meningitis in his organization.

4. Isolation of a pure culture of an organism showing the cultural, morphological, tinctorial and serological reactions of the regular type of meningococcus.

5. Sudden cessation of cases following his removal from the organization.

6. Demonstration of masses of bacteria in the adenoids removed from the nasopharynx, showing the morphological and tinctorial characteristics of the meningococcus.

7. Persistent negative cultures from the nose.

8. Persistent negative cultures from the nasopharynx following the healing of the operative wound.

CONCLUSIONS

1. That the epidemic which made its appearance in the 110th Ammunition Train was due to a carrier, who was identified as Pvt. R. R.

2. That proper isolation methods being instituted, the epidemic was checked.

3. That the organism was harbored in the nasopharynx exclusively.

4. That the persistence of the carrier condition was due to the localization of the organism in the adenoid tissue.

5. That local medicinal remedies were effective in obtaining negative cultures only while they were being used, but had no value in the relief of the carrier state. On the contrary, their employment could very easily have led to a false conclusion which might have proved dangerous.

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ASSOCIATION NOTES

A meeting of the Executive Council of The Association was held in Washington, September 30, for the transaction of ordinary business.

The following named 463 officers, having met the requirements of admission, were duly elected members of The Association of Military Surgeons of the United States:

Medical Corps United States Army

Majors

Herman M. Adler
John H. Blackburn
Richard Blackmore
James Ross Clemens
Thomas Darlington
Nellis B. Foster
Charles L. Gandy
Henry Cooper Haden
John A. Hawkins
A. Barnes Hooe
Henry D. Jump
Charles Edwin Kahlke
Willis F. Manges
Edward Martin
John M. Mayhew
Philip B. McLaughlin
William C. Miller
Geo. G. Rambaud
Louis A. Spaeth
William Stanton
Carlyle E. Sutphen

Captains

Charles S. Aitken
James H. W. Anderson
Wylie Mc L. Ayres
Clark G. Axline
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COMMENT AND CRITICISM

SHOES AND CARE OF THE FEET[1]

Everybody admits, theoretically, that the soldier's feet are vital to his efficiency, but when it comes to making and keeping them efficient these seem to be regarded very much as the business of the other fellow, and "the other fellow" does not always materialize. We have never known of a cavalry officer who demanded that a veterinarian should make stated and formal inspections of his horses' feet. This he himself does daily, if fit for his office, and only asks assistance under unusual conditions.

THE MILITARY SURGEON has always been a stickler for periodical physical examination of the command, by medical officers, covering the whole field; indeed this is a requirement of regulations, and the semi-monthly examination, we trust, is honored in the observance. But the condition of the feet of the soldier-man is quite as much the charge of his officer as is the condition of his rifle, and the officer's solicitude should be even greater for the feet, since the man could fight without rifle but not without feet. We are indebted to Maj. Leon C. Garcia, M. C., and Lieut. Hiram E. Ross, M. R. C., through Lieut. Col. Howard H. Johnson, M. C., for the following practical report.

Colonel Johnson writes that the information given is based upon experience with troops in the trenches, during which time the reporters cared for some 4,000 men so effectively that in six weeks but one foot case was sent to the hospital.—EDITOR.

For a period of several months, especially during the winter season, there has appeared on sick report a certain proportion of men with foot trouble of various sorts. These cases were all carefully investigated and remedied so far as possible. The subject of soldiers on sick report on account of foot trouble and the fitting of shoes was carefully studied by the medical officers of this regiment, and the names of these men, their companies and platoons, the type of foot trouble from which they were suffering were all reported in detail as they occurred.

However, for future reference, as a matter of record or for the information of those who follow, we believe it would not be amiss to submit a full report on this important and interesting subject.

[1] With one illustration.

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When the regiment began its field training in France the men were equipped with the garrison or with the field shoe. These men had been fitted with shoes in the United States, and were wearing at that time a thin, close-fitting sock. With the oncoming of wet and cold weather, the men began wearing heavier socks. With these heavier socks the shoes were invariably too small and too short, with the result that a great deal of compression of the feet occurred. Under this compression there is an interference with the superficial circulation in the feet, the skin becomes devitilized, made evident by marked hyperemia and areas of paresthesia in the skin with sensations of stinging, burning and itching. These sensations were often intolerable, causing much discomfort to the soldier, increasing when the men went to bed, and the feet became warm and preventing him from sleep. Further advanced, the condition of chilblains and frosted feet occurred. Many of these cases presented blisters over the toes and heels, local areas of gangrene, and in some cases loss of tissue. Where the shoes were too short, jammed joints, with a great deal of pain in the arch of the foot and pain in the muscles of the thigh and calf of the leg, from muscle strain, resulted. Under field conditions here, men's feet are constantly exposed to moisture. With a tight-fitting shoe there results swelling of the feet, maceration and devitalization of the skin of the foot, making it susceptible to infection. Many of these cases were on sick report in quarters or hospital from one to six weeks, their services during this time being lost to the regiment from a condition which could have been prevented.

Fitting of Shoes.—Owing to the fact that the arch of the foot is elastic and sinks on standing or marching, when the soldier is weighted with his full field equipment, the foot elongates and broadens, and unless the shoe is sufficiently large, pressure results, with the train of symptoms and unpleasant sequelae described above. The fitting of shoes for winter and trench service over here should be done under the direct supervision of the platoon commander, who should have careful instruction in shoe fitting by one of the medical officers. When, in compliance with division orders, the medical officers began the examination of the feet of all the men of this regiment, the company and platoon commanders were required to be present. Where men were found with ill-fitting shoes or foot trouble, the cause and suggested remedies were explained to the officers, with a view of educating them in the causes and prevention of foot trouble, and exciting their interest in the subject. We believe that all officers coming to France should be instructed in shoe fitting and the care of men's feet, as conditions are quite different in the field here than to which we have been accustomed. The routine examination of the feet of all men in a regiment by the medical officers, made every two weeks, takes up a great deal of our time and also keeps a number of companies away from their routine duties waiting for their turn to be examined. If this examination were con-

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ducted by the platoon commanders it would save much for everyone concerned. This would place the responsibility for feet trouble where it belongs—with the platoon commander. Then a case reporting at sick call with foot or shoe trouble could be at once called to the attention of the regimental commander who could hold the platoon commander responsible.

When fitting shoes for winter service two pairs of heavy socks should be worn. The width of one and a half to two fingers breadth should be allowed from the end of the great toe to the end of the shoe. Care should be taken that there is no compression of any part of the foot after the foot has been well stamped in. This necessary length of the shoe is not properly appreciated by either the officers or the men.

The Munson last with its wide toe area is a very satisfactory last. We believe the garrison shoe is too light both in top and sole leather and is not waterproof. The field shoe should be made with more depth over the toes to avoid compression. Reversing the leather presents a surface of open pores on the outside which readily allows the penetration of water into the leather. The smooth surface of the leather next to the skin prevents the ventilation of the foot. Where the leather is not reversed the open pores of the leather next to the skin absorb the moisture of the foot, favor ventilation and lessen maceration of the skin.

Men whose duties require them to remain standing in one place, subject to wet and cold for long periods, such as snipers, machine-gun crews, etc., could wear with great advantage a felt-lined rubber boot similar to the boot used by the lumber jacks in America. Again, if these men were provided with a felt shoe, reinforced by leather over toe and heel, they could be worn in an oversize boot.

Care of the Feet.—It is imperative that the skin of the feet should be kept up to the highest state of resistance. The foot should be bathed daily in cold water, dried thoroughly, powdered with foot powder, and dry socks and shoes put on after the day's drill is over. On going to bed the foot is usually cold; it should be massaged with an animal oil of some kind such as whale oil, lard or tallow. A dry pair of night socks should be worn. On arising the feet should be powdered and two pair of dry socks put on. Shoes large enough to offer no compression to the feet should be used. If foot trouble occurs the soldier should be at once sent to the medical officer for treatment and advice. If the above instructions were faithfully and intelligently followed, the occurrence of foot trouble of all kinds would soon become a rarity instead of a common occurrence. Provisions should be made so that the soldiers could conveniently wash their feet and dry their socks and shoes. We urge the adoption of a sock drier of a type similar to the one used with satisfaction by the British Army, a diagram of which is appended. One of these driers should be provided for each company and could also be used in drying shoes.

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Construction and Repair of Shoes and Their Care.—Excessive oiling of the shoe, while making it fairly waterproof for the time being, prevents proper ventilation and retains moisture in the shoe, which favors maceration and blistering of the skin of the foot. In cold weather the oil freezes and stiffens the leather, traumatising the skin when the shoe is used. Therefore great care should be used that the minimum amount of oil be used and that it be thoroughly rubbed in.

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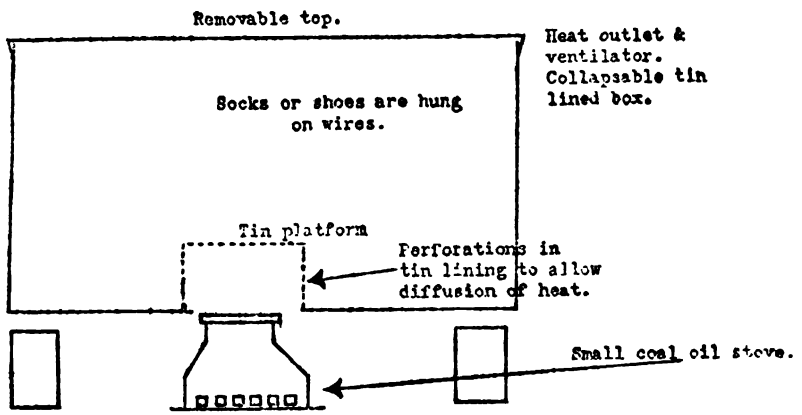
Removable top.
Heat outlet & ventilator. Collapsable tin lined box.
Socks or shoes are hung on wires.
Tin platform
Perforations in tin lining to allow diffusion of heat.
Small coal oil stove.

The shoe should have a thick sole and be hobnailed. The hobnails act as a conductor of cold and favor the conduction of moisture through the sole. For that reason we suggest that the shoes now in use, when they need resoling, should have inserted between the old and new sole an impervious layer of some material that is waterproof and non-heat conducting, such as oiled paper, oiled silk, oiled belting of some fibre composition. We note that the British field boot is constructed with some waterproof fiber composition between the soles. The best that we can suggest to be used between the soles is a layer of Neolin, which has proven a very satisfactory substitute for sole leather and fufills the above requirements of a non-conductor of heat or cold and is waterproof, even when perforated by small nail punctures.

We suggest a shoe that, when constructed, will involve the following principles: (*a*) Shoe constructed with smooth side of leather out, Blucher top, Munson last; (*b*) deep wide toe area; (*c*) leather insole; (*d*) Neolin sole or some fiber or lineolum composition. This is elastic, no capillary action around the nail perforations for water. Maintains warmth and dryness of the sole. (*e*) Heavy leather hobnailed sole. Fewer hobnails could be used.

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WOUND STRIPES

In the *British Medical Journal* for August 24, 1918, Dr. Oscar Holden, of Southampton, communicates the following note:

The modern military method of denoting upon the sleeves of soldiers the number of times they have been wounded in action is, as many other everyday incidents, not as new or original as may be imagined. In Schoolcraft's great work on "The History, Condition, and Prospects of the Indian Tribes," it is stated that upon the grave-posts of old time Indian chiefs various emblems were drawn; being, in fact, an epitaph in the pictorial writing of these tribes. Amongst other matters of family interest and individual distinctions were short vertical lines drawn usually immediately beneath the Totem, to indicate the number of times the deceased had been wounded in battle. Our modern systems and civilization have, perhaps quite unknowingly, gone back to the old pictorial methods used by the Indian tribes of the seventeenth century.

MEDICAL OFFICERS' TRAINING CAMPS

Major Chas. S. Williamson, M. C., who is sanitary officer at Camp Greenleaf, Ga., sends us the following comment:

That the Medical Officers' Training Camps are exerting a marked influence upon the medical profession at large is generally conceded. As time wears on the conviction has been gradually forming in the minds of those best qualified to judge, that there are numerous collateral results which are likely to assume an importance not previously dreamed of. This is particularly the case in respect to sanitation and preventive medicine. These have been the stepchildren of medicine and had, up to the present time, hardly begun to win for themselves their proper place in the respect and esteem of either physician or layman. Nor does this apply only to the physician in smaller communities. Indeed, in the latter, where there are often only two or three practitioners, one of these is pretty certain to be health officer, whereas in a larger city most of the medical profession are entirely unfamiliar with the work of their health department, excepting so far as it touches their particular line of work. It is probably a fair statement to say that scarcely one in a hundred has given any serious thought to the broader question of the prevention of disease in general.

With the advent of the medical officers's training camps and with a considerable proportion of the doctors of this country attending them, conditions are entirely changed. Such men are, along with their other work, being given what amount to postgraduate courses in preventive medicine and sanitation. It is hardly necessary to say that the viewpoint of the Army is and always has been rather to prevent than to cure disease. The primary purpose of this instruction in sanitation is, of course, to train civilian doctors to become sanitary officers of the army, at least during the present emergency. As the work has progressed, it has become increasingly evident that, however important this purpose is and however satisfactory its results may prove to be from the army standpoint, the actual results attained will be infinitely more far-reaching in their effect. The reason of this lies first in the entirely different viewpoint which the doctor

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receives by virtue of his training in these camps. It is here that he is taught to recognize the value of the ounce of prevention as compared with the pound of cure It is here that he is taught to look upon disease, not from the standpoint of the individual, as heretofore, but from the standpoint of the Army, that is, of the community. Every one of these physicians who has had this opportunity—and that it is a real privilege and opportunity the writer can abundantly testify—will go back to his community with a new viewpoint and a new responsibility; a new viewpoint in that he now appreciates, as he never did or could previous to his army training, what sanitation really is and what it has already accomplished, not only for the army but for the community as a whole; a new responsibility, which he will not shirk, in that he now sees clearly his obligation to the community, which before he but dimly appreciated. The longer his army activities continue, the more thoroughly will he become imbued with a sense of responsibility to the community and the greater will be his influence along these lines when he is returned to civil life.

Only those who have had occasion to come into direct contact with the physicians entering our training camps, and especially those whose duty it has been to pass upon their qualification, can realize what an extraordinarily small proportion of men have any adequate idea of the problems of sanitation and preventive medicine. While qualified men are scarce, there is no dearth of bright, alert young men with a good all-round training, and such men when given the opportunity are quick to grasp the subject sufficiently to render them competent to carry on the duties of sanitary inspectors, epidemiologists, etc. More than this, they are still quicker to grasp the importance as to what this training means to their community when they return home. Cities and towns will not have to search in vain for men trained to take charge of the health of the community, for there will then be a large body of men going back into civil life, able to cope with these problems, and many of whom, especially among the younger men, look forward to this as a life career. It needs no prophet to see that sanitation and preventive medicine are destined to go ahead by leaps and bounds with the return of peace conditions, and with the return of all these men to their usual work.

It may not be without interest to sketch briefly what is actually being done at Camp Greenleaf along the lines of instruction in these subjects. To begin with, all students are given a course of lectures embracing the most important points in sanitation and preventive medicine. This course is, of necessity, brief, yet quite adequate to give them a good insight into the subject. They do collateral text-book reading on assigned topics and are quizzed and graded on these. Especial stress is laid upon practical instruction in small groups in making sanitary inspections. They learn how to inspect barracks, mess-halls, kitchens, places of public assemblage, sewage systems, drainage areas as well as numerous civilian organizations present in the camp, such as laundries, restaurants, barber shops, etc. This means that they are given opportunities not only to study military organizations, but are also given instruction directly along the lines of a civilian health officer's work, since a cantonment like this is, in many respects, a fair sized town by itself.

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A considerable number of men are picked out for a much more comprehensive course. On the completion of their elementary course they are sent to the School of Sanitation and Applied Hygiene, and there receive a month's intensive training. This course is eminently practical. The student is required to study the life cycle and the habits of the various flies and mosquitoes and is taught to differentiate the more important ones. He studies in detail the hookworm and is given abundant opportunity to examine the feces of hookworm patients and to familiarize himself with the treatment. Much time is spent in field work. He accompanies a gang of men who are actually carrying out the work of mosquito eradication, and sees and reports upon the methods of straightening the small streams, ditching and clearing the ground and oiling pools and creeks. He learns how it is done by actually seeing and helping to do it. He is required to take samples of water from given places to examine for mosquito larvae and, if found, to differentiate these and to indicate the measures for their eradication.

A further part of the work embraces the study of the methods of disposal of waste such as sewage, garbage, manure, sullage water and refuse of various sorts. When it is realized that a cantonment of 30,000 inhabitants constitutes in itself a moderate sized city, it will be evident that these men are not only acquiring information necessary to them during their stay in the Army, but at the same time are actually engaged in the solution of problems which confront municipalities of equal size. An outdoor museum of sanitary appliances, covering several acres with working models, assists practically in this study.

Still another aspect of their instruction is along the lines of examination for communicable disease. They become familiar with the measures taken in the army to prevent these diseases, and it is a truism to say that infinitely more attention is paid to this subject in the Army than in the rank and file in civilian communities. Water supply and the methods of water purification receive considerable attention. They examine into the workings of a chlorination plant and become familiar with the interpretation of water analyses. This particular cantonment has a large swimming pool over which strict bacteriological watch is kept, and the students familiarize themselves with the proper conduct of such a pool. Throughout the entire course systematic reading is required, and each student presents daily a written abstract of this reading upon which he is graded.

One entire week of the course is given to an exhaustive sanitary survey of the camp. This is made in the utmost detail, and the student presents his report in writing as a thesis. These reports are carefully analyzed and criticized.

While it would be absurd to contend that so short a course suffices, however intensively it may be carried out, to make even well-prepared men finished sanitary officers, yet it is believed that a thoroughly substantial foundation is laid. This should suffice to fit them for their army duties, and the training which they have had should be more than sufficient to enable them to leaven the great mass of physicians in their respective communities.

No description of the activity of the camps would be complete without mention of the work in hookworm eradication which is being carried on under the direction of the Surgeon General. Every recruit coming into the service from the so-called hookworm states is systematically examined for this disease and,

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if found positive, is appropriately treated until cured. At Camp Greenleaf all positive cases are immediately transferred to a special battalion from which they are not released until cured. If, in an emergency, it becomes necessary to send out such a case on War Department orders, these cases are properly noted and the treatment is finished in the place to which they are sent. Preliminary statistics indicate that for this camp some 40 per cent of the men coming in from these states will be found positive, and it is probably no exaggeration to say that if the cantonment were productive of no other useful result, the work in hookworm disease alone would justify its existence.

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CURRENT LITERATURE

Gun-shot Wounds of the Knee-Joint—A Report of 100 Consecutive Cases, by Capt. E. Tissington Tatlow, R.A.M.C. *British Journal of Surgery*, Vol. v, No. 19.

The proper treatment at a clearing station is as follows:

Early Operation.—The complete removal of damaged tissue which makes it possible to close the wounded joint completely.

This was a rare event once; now it is the rule. Few cases of suppurating wounds with complications now reach base hospitals.

Out of the 100 cases, there died (both after amputation), 2 cases; successfully amputated, 4; successfully resected, 9; unoperated upon, 12; evacuated to England with normal temperature, with healed or granulating wounds, 73.

The lesions are divided as follows: Tear of capsule only, 9 cases; through and through wound without bone injury, 13; through and through wounds with bone injury, 25; retained foreign body in joint without bone injury, 24; retained foreign body with bone injury, 29.

Kind of missile.—Revolver bullet, 1 case; machine-gun bullet, 4; rifle bullet, 9; shrapnel bullet, 9; high explosive fragments (shell, bombs, grenades), 77.

Organisms found in 37 joints: None, 17; streptococci, 13; B. aerogenes capsulatus, 3; staphylococcus aureus, 2; staphylococcus albus, 1; diphtheroid, 1.

Results of the 13 streptococcal infection; Resected, 5; amputated, 5; resection patella, 2; Carrel-Dakin treatment and drainage, 1.

Of the total series of 100 cases, but 11 cases were resected and 6 were amputated, showing the gravity of streptococcus infection.

Of three cases infected by B. aerogenes capsulatus two were resected; in the other, a high explosive fragment was removed, and then treated by B. I. P. P.

Of tear of the capsule only, there were nine cases: Amputations, 2; resection, 1; B. I. P. P., 5; salt sack, 1.

Of through and through cases, with no bone lesion, there were 13 cases as follows: no operation treatment, 9; excision and suture, 4.

Foreign body in joint wound and no bone lesion, 24 cases: Removal of missile B. I. P. P. and suture, 6; removal of the missile, lavage and suture, 6; Carrel-Dakin treatment, 2; formalin and glycerine injections, 2; no operation treatment for removal, 7; salt sack, 1.

Bone lesion involving the knee-joint, 54 cases: Compound fracture patella, 11; fracture shaft femur, 5; fracture, both condyles, 3; fracture, single condyles, 20; fracture head tibia, 10; fracture int. condyle and outer head tibia, 1; fracture patella, ext. condyle, head tibia, 1; fracture patella and inner condyles, 1; fracture both condyles, 1; fracture intercondylar notch, 1.

Wound of joint involving patella, 11 cases: Resection patella, 4; suture patella fragments, 1; treated conservatively after toilet, removing of foreign body and suture of capsule, 6.

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Of the 100 cases, 12 did not undergo operation. Concerning these 12 cases, 10 were through and through wounds, 3 with fracture of the shaft of femur, 1 fracture head tibia, and 1 a fracture of the condyle.

Two cases had retained bullets. In 6 cases, wounds were caused by rifle bullets, 3 by shell fragments, 2 by machine-gun bullets, one by a shrapnel ball. Of the 100 cases, 68 were operated upon at clearing station. Thirty-five were completely closed at operation and required no further operative treatment except 2; one revolver bullet left in was subsequently removed; in the other, staphylococcus infection set in and it was opened up.

Thirty-four cases were operated on at base: 14 had been operated on previously at clearing station; 20 had had no operation before reaching base. Of the 20 unoperated cases, 3 suffered amputation, 5 were resected, 2 had resection of patella; 6 had operations for the removal of foreign bodies. It was necessary to do minor operations on the remainder.

TREATMENT AT BASE HOSPITAL

1. When foreign body is still in and about joint proceed as follows: If it is imbedded deep in the shaft of the femur, in a condyle or head of the tibia and the joint is quiescent, the foreign body may be left undisturbed.

2. A large foreign body free in the joint, or protruding out of bone into the joint cavity, should be removed.

3. As to the time of removal of foreign body, the usual practice is to remove it immediately.

4. The operative procedure consists of excision of the track, employment of a fresh set of instruments for the removal of the foreign body, a gentle mechanical flushing of the area in which it was imbedded, the placing of about 15 grains of bismuth iodoform and paraffine paste into the joint and when possible to suture the capsule and close the wound entirely. Look carefully after all bone injury and, after careful curettage, place B. I. P. P. in the resulting cavity.

The treatment of cases of general arthritis of the streptococcal variety is a most important problem at the base. Such cases were formerly treated by a posterior drainage operation. They were apt to do badly especially when bone lesion was present. In the present series the author has practiced resection in preference to posterior drainage. The resection has included the patella. All the synovial membrane possible is left as a protective barrier. The operation area is next treated with B. I. P. P.; a gauze pack is placed between the bone ends and extension is applied.

In three to ten days, depending on the pulse-rate and general condition of the patient, the pack is removed under nitrous-oxide anesthesia, the extension removed and the long surfaces are then allowed to come together. It is at times necessary to irrigate about the resected area on account of suppuration. It is rarely the case that union has failed to take place.

The fixation treatment is important. The lower end of the femur, after resection, is apt to slide outwards, which destroys the alignment of this bone with the tibia. The displacement is overcome by the use of a short Robert Jones crab splint in which the limb is made to rest and which is itself placed on a

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Thomas hip-splint. Osteomyelitis has not figured as a complication in any of the cases.

The author recommends that every case at the clearing station should be so treated that secondary resection shall be unnecessary at a later day. In any case, with general acute streptococcus infection and a bone lesion, resection is a proper procedure. On the other hand acute arthritis from the staphylococcus group yields readily to simple drainage methods. Without bone injury, simple incision usually suffices. With bone injury, it is safer to use the Carrel-Dakin treatment at the site of injury.

Pure *B. perfringens* cases involving the joint are very amenable totre atment; the joint may be sutured after removal of the foreign body and lavage.

Pyemic infection of the knee-joint by staphylococcus or other organisms is treated by incision, mechanical lavage, the application of B. I. P. P., suture of capsule and skin closure.

Aspiration gives bad results and is not recommended. Sterile effusions are protective in nature and should be left alone; when infected they should be evacuated. Aspiration should only be used as a diagnostic method.

Practice absolute immobility, use few dressings; operative procedures short of resection should be carried out when the limb is still on a splint. Treat every case of wound in the joint, for a time at least, while the limb is on a Thomas splint, with a fixed extension, using pulleys or not for the splint itself, as may seem advisable.

Tighten the extension if starting pains occur at night. When the joint is quiescent without pain, the limb is placed on a splint: the extension bands are applied, but not tightened. If the knee "jumps," the bands are at once tightened. Small plates of perforated zinc laid on cross-ribbons of aluminum are the best supports, as they are easily changed and the skin attended to by the ward nurse with a minimum of movement. A Balkan support is necessary.

CONCLUSIONS

1. Early operation, if the procedure be radical, especially when the entire capsule can be sutured, results, in 94 per cent of cases, in a sterile joint, and therefore in a successful issue.

2. Where a pack or drain is used down to a tear in the capsule or to a cavity in bone the results can never be depended upon.

3. Removal of missiles from the joint within the first week, even in the presence of sepsis (other than that due to streptococcus) can be followed by immediate suture, B. I. P. P. being used to aid sterilization.

4. The Carrel-Dakin method is most useful for the treatment of bone lesions or septic peri-articular conditions. It is almost impossible to sterilize a severely infected joint by this method.

5. In the presence of a general infection of the joint by the streptococcus, resection gives good results, even when performed in the second or third week.

6. Cases with severe bone injury should be treated more often than they are by an immediate resection of the joint at the clearing station.

This valuable article, one of the most important contributions on gunshot wounds of the knee in this war, is accompanied by 16 semi-diagrammatic figures

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made from the outlines of X-ray plates; a table containing 10 cases of resections of the knee with salient notes and results, as well as a table of six cases which include the cases amputated, and finally a table which includes the particulars of the total one hundred cases.

LA GARDE.

On the Acidosis of Shock and Suspended Circulation, by Sir Almroth Wright, C.B., M.D., F.R.S., and Captain Leonard Colebrook, M.B., R.A.M.C. *The Lancet,* June 1, 1918, pp. 765–5.

We are indebted to the authors for making a valuable contribution to our knowledge of the already large and much discussed subject of "shock," likewise of acidosis. It seems, indeed, as if the intentions had been to fix, once for all, the correlationship existing between the two and to place the hitherto quasi tentative therapeutic measures employed in the treatment of shock upon a firm physiological and pathological basis. The problem appears to have been attacked with vigor and the experiments so fashioned as to elicit a most direct, clear-cut, non-evasive answer to a definite inquiry. All the experiments were performed on rabbits.

A fall in arterial pressure and a consequent slackening in the peripheral circulation being, perhaps, the largest common factors in the production of acidosis and the symptomatology of shock, the first set of experiments was designed with a view to ascertaining the effects of arresting and reopening the circulation in these animals. The rabbits were put under ether, one or several of the main arteries clamped, and samples of blood taken from time to time for alkalinity determinations. In this series of observations it was found that, under the above experimental conditions, "a very appreciable quantity of a non-expirable acid is conveyed into the blood stream" and we are reminded, incidentally, of the practically not unimportant fact that "the same effect will, of course, be obtained with a ligature, tourniquet or Esmarch's bandage."

In a second set of experiments, cold and alternative hot immersions were made use of. In the series of six rabbits, the procedure consisted in the immersion of the animals, for from 15 to 40 minutes in an ice-bath, then in a hot bath (temperature not given) for 5 to 7 minutes; after that, placing them in an incubator at 37° C. In all of the six rabbits, before their immersion into the ice-bath, the alkalinity of the blood is recorded as N/35. Three of the animals died after being taken out of the baths at intervals varying from a few minutes to 20 minutes (rabbits 2 and 3) and six hours (rabbit 6). The alkalinity, in rabbit 2, is recorded as N/60 immediately after the bath (ice?) and as N/100 soon after death; in rabbit 3, immediately after the bath, as N/60, at death N/300. In the surviving animals the alkalinity was not below N/100.

As might, indeed, have been expected, the acidemia in this series was much greater than in the preceding, considering both the well-known extreme sensitiveness of rabbits to the above method of treatment and the consequent relative more serious inroads on the normal processes determining the lives of these animals. Indeedk the recorded alkalinity values would indicate post-mortem values.

In their third series of experiments, the lower limbs of four rabbits were

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subjected to strong faradic stimulation: two, after ligation of large veins (fem., inf. v. c.), one under anesthesia and the fourth, without either ligation of vessels or anesthesia. The recorded alkalinity, before stimulation, varied between N/30 and N/35: that in three of the rabbits, immediately after stimulation, was N/120, pointing with directness to a myogenous form of acidosis.

The authors will undoubtedly meet with the unqualified agreement on the part of the profession as regards the acidemia of the wounded man leaving "no room to doubt that it is one into which the factors we have been studying all enter." Nor will there be any very serious differences of opinion with regard to their generalizations on the acidemias probably present in cases of chilblains, in trench foot, in Asiatic cholera and in a great variety of other conditions depending on a faulty or interrupted circulation and attended by an insufficient or an entire suspension of the processes of oxidation. Death and dissolution follow closely upon the heels of such conditions. An irreparable injury, an irreversible change occurs in all tissues, even when deprived of oxygen for only a short time and, when such changes have gone so far as to affect the respiratory ganglia in the medulla, life cannot be restored even by artificial respiration nor by the introduction of $NaHCO_3$.

The principal postulate being, as was anticipated at the beginning of this brief review, the "*Resuscitation Procedures in Shock*," their remarks on this subject are best given in their own language:

"The ideas which we have been developing have clearly a direct bearing on the policy to be adopted in the treatment of cases of shock—the warming up of the patient, and the intravenous injection of alkali recommended by Cannon.

"With regard to the warming up of the patient there is an important distinction to be established. As a prophylactic measure the giving of hot drinks and the application of warmth is assuredly the ideal procedure. For by maintaining the circulation the acidosis will be prevented. No such enthusiastic view can be taken of heat applied as a remedial procedure in fully developed shock. No doubt it is there urgently required for the reëstablishment of the circulation and the breaking of the vicious circle. But inevitably it will convey into the blood stream additional acid, increasing the acidemia. Our experiments upon rabbits subjected to cold immersion have very vividly impressed upon us that too rapid resuscitation by warmth—*i. e.*, a too precipitate washing of muscle acid into the blood—may be perilous to life. We venture to suggest that this possibility should, in connection with resuscitation procedures—and not only in those applied to the wounded—be constantly kept in view. And it would seem to us theoretically desirable, for the avoidance of resuscitation acidemias, wherever possible, to commence procedures by a bicarbonate of soda injection. With respect to the risk of piling up an anesthesia acidosis on the top of a resuscitation acidosis, it is clear that security against this would be only obtainable by ascertaining, before sending the patient on to operation, that his blood alkalinity had returned to the normal. We would, in connection with this, point out that the method of measuring the alkalinity of the blood by the method of direct titration in capillary tubes is very easily learned; and that, once a sample of serum has been obtained, the testing takes only two or three minutes."

H. G. Beyer.

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On the Pathology and Treatment of Poisoning by Trinitrotoluene ("T. N. T.") and on the Action of Certain Other Poisons Which Affect Fat Metabolism, by Major Alexander G R. Foulerton. Royal Army Medical Corps (T. F.) (From the Hygiene Department, Royal Army Med. College.) *Jour. Royal Army Med. Corps*, vol. xxx, No. 6, June, 1918.

Poisoning by trinitrotoluene forms a constant, ever present danger to those engaged in the manufacture of it, to those that handle it in ammunition factories and to the gunners exposed to the products formed in its explosion. The process therefore interests and concerns not alone the soldiers in the field but also and especially the army of munition makers at home, hence the widespread attention which the effect of T. N. T. on the organism has received ever since the beginning of the war; hence, also, the great importance of any contribution to our knowledge on the subject. A knowledge of the pathology involved in the process of the poisoning by this substance is obviously a necessary prerequisite for an intelligent mode of preventive and curative treatment of the condition.

From a study of certain clinical and pathological features presented in cases of poisoning by trinitrotoluene, the author is disposed to include the process in a group of cases of poisoning, occurring amongst workers with tetrachlorethane in aircraft factories and cases of poisoning by dinitrobenzene ("D. N. B.") amongst munition workers, cases of "delayed" chloroform and ether poisoning, and of acute phosphorus poisoning. "In all these cases there may be an acute manifestation of jaundice, sometimes with concomitant glycosuria or acetonuria, as indications of disorder of metabolism." "In all there may be found after death either fatty changes in the liver . . . or fatty changes in association with disorganization of the parenchyma cells, extensive interstitial fibrosis and shrinkage of the gland as a whole." Fatty changes in the kidneys and in the heart muscle have also been noted.

The author, however, throughout his paper, emphasizes the fact that the chief factor in poisoning by trinitrotoluene and these other substances mentioned is a *disordered fat metabolism* caused by the absorption of the poisons having a special affinity for fats. "These fatty changes in the liver and kidneys," according to the author, "are not the results of a fatty degeneration of the cells of these glands; they represent rather a fatty infiltration, or engorgement, of the organs with fat brought to them from elsewhere." The liver, overcharged by fat, mobilized elsewhere in great quantities, seems to be unable to metabolize it both by reason of its quantity as well as for the reason that it carries with it quantities of toxins influencing the normal activity of the cells directly.

In discussing "the normal process of fat metabolism" the author describes fats in the body as occurring in three conditions: as "*circulating food fat*," in the lacteals and thoracic duct, on the way to the liver through the circulation; "*reserve fat*," stored up in the connective tissues; "*available organic fat*" by which he means fat made available for use in the economy through the action upon it of certain specific substances manufactured by the liver cells.

As material for the study of the microscopical changes found in fatal cases of poisoning by trinitrotoluene, the author had the bodies of three women who died in the "South London Hospital for Women," all victims of poisoning by

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trinitrotoluene. The partial histological examination made in these cases was limited, in Case 1, to the liver, kidneys and lung; in Case 2, to the liver, kidneys and heart; and, in Case 3, to the liver, kidneys, lungs and pancreas.

We may omit the details of the histological technique employed by the author, and, further, limit ourselves to a brief abstract of the findings in the three cases.

Case 1. "Sections of the liver showed advance degeneration and disintegration of the parenchyma cells with complete structural disorganization of the gland; a very large quantity of lightish brown granular material was scattered in small masses throughout the liver, some of the masses gave the reaction of hemosiderin and others did not. A few collections of rather large fat globules were found in some of the sections, but most of the sections were free from any trace of fat. The kidney sections showed cloudy degeneration of the epithelium of the tubules generally, where the structure was not masked by the accumulation of fat. The straight portions of the tubules in the medullary zone contained a good deal of brownish material, varying in color from a deep to a light greenish-brown. The convoluted and straight portions of the tubules showed thickly numerous granules of fat both in and outside the epithelial cells. To the naked eye the lungs appeared to be in a condition of solid edema. Microscopically, there was marked cellular infiltration of the connective tissue stroma of the lungs, without any marked exudation into the alveolar spaces. Scattered through the interalveolar tissues there were numerous fat granules, some lying apparently free in the tissues, others contained in rather large mononuclear cells. Some masses of brownish material occurred here and there in the interalveolar tissue."

Case 2. "Sections through the liver showed advanced interlobular round-celled infiltration and fibrosis with marked degeneration of the parenchyma cells generally. There was a large amount of fat, distributed in globules of various size, partly in the interlobular round-celled and fibrotic tissue and partly either in or between the parenchyma cells . . . Numerous small masses of brownish pigmented material were scattered throughout the liver, only a relatively small portion of which stained as hemosiderin. A large quantity of fat was present in the kidney . . . confined to the convoluted and straight portions of the tubules in the cortical zone . . . the glomeruli were free from any traces of fat—heart showed brown atrophy.

Case 3. "Same as other two cases with but slight variations. The pancreas showed an extensive fibrosis of the interstitial tissue with advanced degeneration of the parenchyma cells—full of globules of fat of various sizes."

The author seems to be convinced of the fact that the fatty changes noted in the liver could not represent the consequences of a primary fatty degeneration of the parenchyma cells of the gland but are the result of an infiltration of the liver by fat carried to the gland from elsewhere. For him, the accumulation comes either from an abnormal liberation of stored connective tissue fat or is due to an impairment of the functional activity of the liver cells, failing to metabolize such fat and unable to convert it into what he calls "*available fat*" or to both these factors, as appears to be the case in poisoning by trinitrotoluene.

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The kidneys, being engorged with fat, in the absence of any marked alteration of the epithelium in the medullary portion of the kidney, it might well be supposed that the liver, having become functionless in fat metabolism, the fat was eliminated unchanged by the kidneys. In case 8, which had recovered from the direct action of the trinitrotoluene, dying later from the sequelae to the acute poisoning, death was due to an aplastic anemia owing to destruction of the bone marrow at an earlier stage of her illness.

Readers interested in the author's results obtained with some of the laboratory animals, cats and rabbits, must here be referred to the original paper. Our interest will, very naturally, be centered on the lessons to be derived from our author's observations and experiments for prevention and treatment.

For the protection of the individual worker, the author makes some very pointed remarks as to a modification of his diet. Thus he states that milk, on account of its high fat-content and, in view of the ready fat solubility of trinitrotoluene—"as all other foods of a fatty kind"—should be avoided as much as possible. Since fatty foods will favor the absorption of the poison from the intestine, our author suggests that the fatty constituents of the munition worker's dietary should be replaced by "sugars—by glucose and by fructose supplied in fruit foods." Trinitrotoluene, already fixed in the fatty constituents of the skin, its elimination should be promoted "by frequent warm baths, especially vapor baths." The same principles that figure in prevention should guide us in actual treatment of cases; all fats should be cut out from the dietary, so as in the first place, to relieve the liver of its metabolic work and, in the second place, in order to avoid aggravating the already existing effects of the lipemia. "Sugars should be substituted for fat foods, definite doses of glucose being given together with fruit . . . not only in substitution for fatty foods, but also, because of theoretical considerations which suggest that oxidation of the excessive floating fat will be favored by its administration." The combustion of fats needs the flame of carbohydrates to set it going.

In the above recommended dietary for ammunition workers, the substitution of fatty foods by carbohydrates, especially sugars, the reviewer is inclined to locate an additional reason for the sparse distribution of sugar among those of us not employed in munition factories!

"The diet then," our author says, "should consist mainly of carbohydrates with very small quantities of lean meat or preferably fish—excluding the fatty kinds, such as herring, mackerel, etc."

As an external treatment, the use of warm vapor baths, followed by friction, is highly recommended in accordance with the assumption that the natural elimination of trinitrotoluene, fixed in the skin, is outwards.

H. G. Beyer.

The Scabies Problem on Active Service, by Major H. MacCormack, M.D., F.R.C.P., and Capt. W. D. D. Small, M.D., F.R.C.P.E., both of the Royal Army Medical Corps. *Jour. Roy. Army Med. Corps*, Vol. xxx, No. 6, June, 1918, pp. 601–5.

"Of the skin diseases found amongst soldiers—excluding pediculosis—scabies is by far the commonest." In our authors' experience, it is the secondary

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pyodermic complications that are the real cause of prolonged illness. While a simple, uncomplicated case may be cured by the proper treatment of three or four days, when complicated, the average stay in a hospital is 31.67 days! It is stated that scabies amongst soldiers differs in type from that usually met with in civil practice and that, unless the differences are appreciated, many cases will not be recognized and lead to the dissemination of the disease by undetected "carriers." While the eruption is distributed much in the usual fashion, the sites being the wrists, hands, penis, lower abdomen, anterior axillary borders, elbows and buttocks, the interdigital burrows are but rarely seen and vesicles are much more common. In the majority of cases the penis is said to be involved, so that the discovery of papules or crusts on either the skin or mucous membrane is almost pathognomonic. "This serves in doubtful cases to distinguish scabies from the acute pediculosis so frequently seen, and is for this reason an extremely useful diagnostic symptom." Secondary coccal infections are common and sometimes so severe as to mask the primary disease, rendering it liable to be overlooked.

Interesting as are the details, cited by the authors, as regard the differential diagnosis, we must confine ourselves here to giving a brief summary of the preventive and curative measures advocated and recommended by them.

(*a*) *Preventive Measures.*—All the evidence pointing to blankets as being the chief means of disseminating the infection, their disinfection by a method such as the Clayton sulphur vapour apparatus or some other accepted form of sterilization is recommended. Horses being under suspicion of spreading the infection, these must be kept under observation and treatment. French writers having laid some stress upon the venereal origin of scabies, this, as a possible source of infection should be kept in mind. But of the greatest importance is the early detection of every case of scabies, since each case acts as a carrier and is "the potential starting point of an epidemic."

(*b*) *Curative Measures.*—These "should include exposure of the parasite and its ova and their destruction by remedies short of producing dermatitis." Sulphur is the acknowledged, most efficient remedy for scabies, but it must be so administered that the patient gets neither too little nor too much of such treatment, too little leaving him uncured, too much producing dermatitis and so increasing his period of unfitness. The sulphur vapor method is unqualifiedly condemned by our authors. Liquid preparations of sulphur (liquor calcis sulphurata) are unsatisfactory, while, for both simplicity and effective certainty, no method is said to be superior to that of simple inunction with sulphur ointment (B. P.), when due regard is had to necessary details.

As the authors insist that the method of application is of paramount importance, we may perhaps do best to reproduce it in the authors' own terms:

"(1) On the first day of treatment, the patient is given a hot bath, and provided with plenty of soft soap, and a large moderately stiff nail-brush.

"(*a*) Before entering the bath, he rubs himself thoroughly all over with the soap, massaging it into the skin, and paying particular attention to the fingers, toes, wrists, penis and axillae. This should be continued for at least ten minutes.

"(*b*) He then enters the bath, which should be both long enough and contain

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a sufficiency of water to permit of immersion to the neck. After first steeping for fifteen minutes, he scrubs himself vigorously all over with the nail-brush for the purpose of opening burrows and vesicles. In cases where the eruption is particularly severe or painful, this part of the procedure may be correspondingly modified. After the bath, a final inspection should be made, when any unruptured vesicles can be opened with a surgical needle.

"The bath is given with the sole object of opening up the haunts of the acarus and exposing it to the action of the parasiticide to follow. It is obvious that shower or steam baths cannot fulfil this purpose, and examination of a patient so treated will reveal the burrows and vesicles still intact.

"(2) After removing the soap and drying, a liberal quantity of sulphur ointment (B. P.) is provided with which the patient rubs himself vigorously all over, from the neck downwards, special attention being paid to the affected parts and to the fingers, wrists, genitals, axillae, toes and ankles. The ointment must be liberally applied and thoroughly rubbed in, so that when finished he should be literally 'soaking' in it.

"The inunction is to be repeated in this manner twice daily for three days—*i. e.*, until the patient has had in all six applications. Each must be complete, and for this it is obvious that all clothing be first removed. The treatment of limited parts of the body is useless.

"(3) Finally, on the fourth day, but not before, a second bath is given, and all the patient's clothing and bedding sterilized to prevent reinfection. Even such articles as wrist straps, strings of identity disks, gloves, etc., should be included.

"The vast majority of cases, unless there be secondary complications, will be found cured after three such days of treatment. Should any doubt exist, 2 per cent beta-naphthol in vaseline may be used daily for four more days. Only under exceptional circumstances should sulphur ointment be applied for more than three days, since its continued use is liable to cause severe dermatitis. Indeed, in susceptible persons, a mild degree may be occasioned by the three-day treatment. This is usually easily cured by zinc ointment or Lassar's paste. At the completion of treatment, the existence of some degree of itching is not uncommon; this is due to the remedy and does not indicate failure of cure; it will rapidly pass off and should be disregarded. Some days also will probably elapse before all the lesions of scabies have disappeared, although the man is no longer infective. A certain degree of pigmentation may persist indefinitely."

H. G. Beyer.

Outbreak of an Acute Febrile Disease in Three Factories and an Industrial School in Glasgow, by Dr. A. MacLean. *The Lancet*, July 13, 1918, p. 36.

The author states that during the first week of May of this year, acute febrile disease, with symptoms ressembling those of influenza, invaded three factories and one industrial home for boys in Glasgow. The three factories accounted for 420 cases, the industrial school for 16. The disease was "of a very mild type . . . and rapid recovery occurred usually in two to four days." No deaths occurred. A similar outbreak had occurred in Lanark county, attacking 280 persons in two industrial schools, a public school and a hosiery manufactory.

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The greater number of the cases in this county are said to have presented the same symptoms as the Glasgow cases, but a few had pulmonary symptoms and there were 8 deaths. Epidemiologically, it is noteworthy that the Glasgow outbreak occurred fully a week before the disease appeared in the county of Lanark, and it was ascertained that a boy resident in the infected industrial home stayed at the Lanarkshire Orphanage from May 10 to 15, the first case occurring there in the person of the boy who slept in the same dormitory.

Three types of the disease, occurring in the same epidemic, may, according to the author, be discerned: (1) the usual type, a mild, non-pulmonary type, ushered in suddenly by headache and prostration, temperature varying from 99° to 103° F., followed by recovery on the second, third or fourth day. Sore throat is rarely complained of. (2) A malignant type. "Onset sudden, coma, varying occasionally with delirium, and death takes place frequently in less than 24 hours;" (3) pulmonary type, with symptoms similar to those of the first type "but symptoms of pulmonary involvement, with breathlessness and sometimes cyanosis, are superadded." Congestion, edema, or consolidation of the bases of one or both lungs have also been observed to occur.

Although, as the author states, the bacteriology of the disease has not been completely investigated, two important points have been made out, namely: "The bacillus of influenza is invariably absent. This is in accordance with the clinical picture of the disease. A Gram-negative diplococcus resembling the pneumococcus has frequently been obtained from the nose, throat, lungs and membranes of the brain."

H. G. Beyer.

The Absence of the Bacillus Influenzae in the Exudate from the Upper Air-Passages in the Present Epidemic, by Captains T. R. Little, C. I. Garofalo and P. A. Williams. *The Lancet*, July 13, 1918, p. 34.

It is asked whether the present widely spread epidemic is one of influenza or whether it is something new. The symptoms are described as follows:

"Clinically the disease simulates influenza. It is an acute febrile infectious condition of three or four days' duration. The most striking symptoms are: Sudden onset with chills, severe headache with pain in cervical, dorsal, and lumbar regions, also pain in limbs and general malaise. The face is somewhat flushed and herpes labialis is to be noticed in a few cases. The fever soon attains its maximum, which varies from 99° to 102°. Several cases were observed in which the maximum temperature was 103° to 104°. Usually the highest point is reached on the second day, then follows an abrupt crisis, and on the fourth day the man feels practically normal. Many cases develop a cough, harsh in nature, with a thick sputum, scanty in amount and constant in appearance. It is not the greenish sputum of influenza proper, but is of a white mucoid nature. The urine is somewhat scanty, the appetite poor, and the bowels are constipated.

"It will be noted: (1) That the pyrexia is of shorter duration; (2) that the total course of the disease is shorter; (3) that the gastro-intestinal symptoms are slighter than in trm be aof influenza due to the *Bacillus influenzae* commonly called Pofeiffer's bcillus. It is also noteworthy that convalescence is rapid

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and that as yet we have noted no cases of relapse, recurrence, or of complications. It must be remembered that the cases under our observation were young healthy soldiers in prime physical condition."

Laboratory investigations were carried out in 20 cases consisting in (1) Urinary examinations; (2) leucocyte counts; (3) leucocyte differential counts; (4) blood cultures; (5) bacteriological examinations from nasopharynx, throat and sputum. Our special interest is centered in the results of the last and the very plausible conclusions derived by the authors from their combined investigations, given below:

"*Bacteriological examinations.*—These were very interesting. We observed in all the cases studied that direct smears from the nasopharynx, throat, and sputum contained among the organisms present one which was in outstanding predominance. It was a very small Gram-positive diplococcus, distinctly flattened on its apposing sides. Some of these smears contained no other organisms. In no smear examined were we able to discover the *Bacillus influenzae.*

"Cultures were made in these 20 cases from the two locations mentioned and from the sputum. Legumin serum agar plates were used. All the plates showed among other colonies one sort which was exceedingly abundant. In fact, in a few naso-pharyngeal plates it was in pure culture. In all the plates this colony was present vastly in excess of any other. It is a small, transparent, granular colony, strikingly like that of streptococcus. In each plate it proved to be composed of the same organism that we had noted in the preliminary direct smears. From no plates were we able to obtain colonies of *Bacillus influenzae.*

"It may be contended that this is due to the fact that we did not use media containing whole blood. It has been our experience that *Bacillus influenzae* grows abundantly on legumin serum agar. We frequently obtain it when making routine bacteriological examinations from the nasopharynx.

"This diplococcus, we find, grows with reluctance on ordinary media. It prefers those containing serum. Hemoglobin also accelerates its growth. It grows abundantly on Löffler's blood serum, legumin serum agar, blood agar, and in bouillon containing a little blood. On blood agar plates there is no hemolysis, but in blood bouillon the erythrocytes appear broken up. The organism does not split up either dextrose, laevulose, maltose, lactose, saccharose. or mannite. It has a slight tendency to anaerobic growth, and in fluid media containing blood a distinct tendency to chain formation.

"When inoculated intraperitoneally it proved non-pathogenic to mice. The temperature of some was raised slightly for 24 hours. They showed a slight but distinct roughening of the hair. These reactions, however, might very well be due to the introduction of foreign protein. Further animal inoculation is being undertaken.

"It will be noted that we found this organism in universal predominance and that we were able to cultivate it in the laboratory, thus fulfilling Koch's first two postulates. His final postulate we have not as yet, however, fulfilled."

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Conclusion

"In conclusion, we wish to point out that although this epidemic has been called influenza for the want of a better name, yet in our opinion it cannot properly be considered such for the following reasons:

"1. The clinical course, though similar to that of influenza, is of very short duration, and there is, so far as we have observed, an absence of relapses, recurrence, or complications.

"2. The present epidemic is not characterised by a sharp leucocytosis and polynucleosis, but rather by a very slight leucocytosis with a proportional lymphocytosis of the small mononuclear variety.

"3. The organism of influenza—*Bacillus influenzae*—was in all cases absent and there was present, with no exception, a Gram-positive diplococcus.

"Of course it has long been recognized that attacks of so-called influenza are often due to organisms other than the *Bacillus influenzae*. Many have been indicated. The purpose of our work was to determine the causative organism of the present epidemic. We consider this to be the above-mentioned diplococcus."

H. G. Beyer.

I. On the Present Fever Epidemic Broken Out Among the Men of the Squadron, reported by Dr. A. Delogu, ten. col. medico, capo-Squadra. *Ann. di Medicina Navale e Coloniale*, Anno xxiv, Vol. i, fasc. v–vi, p. 389.

Since the fever epidemic, described in this paper, resembles the one that broke out in some parts of the United States about a month ago, it will be opportune to present a brief abstract from the accounts given us by Drs. Delogu, G. Saccone and C. Balduino on the same topic to our readers.

It appears from this account that the epidemic began to show itself during the middle of the month of May (?) aboard the battleships of the squadron and some other ships at anchor. From the course the epidemic took, it might be described as one of *influenza* were it not that it differed from the latter by some characteristic phenomena.

From positive information at hand, it became certain that several cases had occurred in another port since the previous winter, but the disease had not assumed an epidemic form until now nearly one-third of the men aboard were down with it.

The author, though accusing, as causative, a pathogenic germ that is transmissible through the air, admits certain other conditions as possibly predisposing: sudden changes of temperature, barometric pressure, overcrowding.

Fortunately, the disease rarely assumed a character of gravity and, even if it did so, there was a tendency of rapid resolution. The period of incubation was short, at most two or three days. Hardly had one case been diagnosed when a number of others, perhaps specially predisposed to the contagion, were stricken at the same time. On two of the large ships, within three or four days, beginning with about 50 cases, the number of patients rose to 400, the disease being preceded but rarely by any feelings of sickness.

The disease commences, almost invariably, with lumbar pains, intense head-

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ache, pains in pharynx or larynx, in the ocular muscles, with lachrymation and fever; the temperature varies from 38° to 40°. The sensorium seems to remain normal.

In many cases there is a dry, angry cough ending in bronchial catarrh; in others, pulmonary complications may be observed after the fifth or sixth day of the disease; sputum becomes sanguinolent later, but the only signs suspicious of the existence of pneumonia is a high temperature and the facies. Most always the appetite remains unimpaired and so do the articulations. In the present epidemic the temperature was, as a rule, higher in the morning than in the evening. The fever ceases promptly in two or three days together with the other symptoms, and the patient recovers from the disease with a general sense of weakness of short duration.

The treatment consisted in the administration of some purgative, in a liquid diet and a little quinine or aspirine. General disinfection of the ship, a more rigorous application of the abdominal bandages, and orders forbidding men to sleep on deck, were strictly supervised and carried out. The number of sputum receptacles among the men was increased.

With regard to the nature and the diagnosis of the disease, the author, while admitting that many of the above-mentioned symptoms speak for *influenza*, the absolute absence of nervous symptoms, save the headache; the absence of digestive disturbances and joint diseases as well as the relatively few complications referable to the respiratory system, would argue against such an assumption. Still more strange, the author thinks, is the fact of the very brief period of convalescence observed during this epidemic, when, in the usual form of influenza, convalescence is very protracted, leaving the patients affected in a state of great nervous and muscular prostration for a long time; this, the author believes, must be admitted as strange, in spite of the well-known polymorphism peculiar to influenza. By some of the author's colleagues it had been diagnosed as dengue, pappataci-fever and "febbre da carbone" respectively!

II. On the Etiology of the Present Epidemic of Fever in Taranto, by ten. col. medico G. Saccone. From the bacteriological laboratory at the Naval Hospital in Taranto. *Ann. di Medicina Navale e Coloniale,* Anno xxiv, fasc. v–vi, Vol. i, May-June, 1918, p. 301.

The present epidemic in Taranto began about the middle of last May, at about the same time that it prevailed in the squadron of battleships and among several detachments on shore, as well as among the civil population; it reached the climax within a few days, and began to decline at the beginning of June until now there occur but a few cases daily.

The disease attacks principally the young without distinction of sex, rarely the old and infants; it seems to leave behind a certain immunity, since there have been no relapses.

The symptomatology of the light form of the disease having been given us by Dr. Delogu (I), we will here produce only what the author has to say on this subject of the serious cases. The serious forms of the disease, representing but a small percentage of all the cases, are characterized, from the beginning, by

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symptoms of lobar pneumonia and pleurisy; while the gravest, lethal cases are complicated also by cardiac and endocardiac lesions; in such cases the urine is albuminous and bloody and contains casts; there is also enlarged spleen.

From the middle of May to the middle of June, there occurred in the hospital 42 cases of lobar pneumonia and 36 cases of pleurisy (percentage not given).

The author's investigations of the *etiology* of the disease are so important as to warrant the reviewer in reproducing them, if not fully, at least with as much detail as will be necessary for a full understanding of the results obtained by him.

Bacteriological examinations were made of blood, of pleural and pericardial exudates, of sputa and of the cerebrospinal fluid (1 case). On the 120 cases at the hospital, in the barracks and on board the ships, hemocultures were practiced. In 20 of these cases the method of Castellani was used and in 100 a 4 per cent glucose agar was employed. In about 50 of these cases in which the infection dated back several days, the results were negative; in 60 cases, examinations made on the first or second day of the disease, 28 proved positive; in 7 cases, in all of which examinations were made practically at the beginning of the disease, the results were strongly positive in all.

The germ that was isolated was a micrococcus which, in many of its characteristics, is said to resemble *M. tetragenus* and, therefore, was given the name of *micrococcus metatetragenus* or of "spring influenza." The size of the coccus varies, sometimes appearing in groups of four or two or even appearing single; not rarely, four or five of them appear in a chain; on solid nutrient media, the arrangement in groups of four occurs less frequently, more so in liquid cultures. The coccus is non-motile and easily stained with aniline colors and by the method of Gram; it grows on all the ordinary media at 37° C.; in broths, it produces a uniform turbidity, leaving a thick, whitish sediment at the bottom of the tube of the consistency of mucus. On glucose agar the colonies vary in size; some are small, others rather large, whitish in color, slightly sinuous in contour, thick in the center, which is dark and opaque, becoming a dirty yellow at the end of a few days. The pellicle it develops on agar is whitish in color, turning into a greyish-yellow, assuming a greasy luster, almost always mucous. On blood serum from cattle and on ascites-agar it grows very well, forming a thinner pellicle than on agar; it shows a vigorous development, also, on potatoes; it grows with difficulty in milk without coagulating it. Investigations with the coccus in animals are said to be in progress. Suffice it to mention that two rabbits were inoculated intraperitoneally, one of which received 10 c.c. of purulent pleuritic fluid, full of germs, and obtained from one of the patients; the other, a smaller animal, received 5 c.c. of a similar fluid. Both these animals had a slight rise in temperature for two days, showing no other signs of sickness.

The germ described above was successfully isolated from a case of lobar pneumonia, one of pericarditis and one from a case of meningitis in which the cerebrospinal fluid, obtained by lumbar puncture, was purulent and showed, besides the germ in question, the presence of a streptococcus. The author promises to follow up his investigations and to furnish us with the results of a more systematic and complete study of the germ in question.

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III. Notes on the Recent Epidemic of Influenza, by Dr. C. Balduino, maggiore medico R. Marina. *Annali di Medicina Navale e Coloniale.* Ann. xxiv, Vol. i, fasc. v–vi, Maggio-Giugno, 1918, p. 396.

The author advances excellent arguments in favor of the epidemic under consideration being, indeed, one of influenza. In his judgment all the symptoms enumerated in the preceding two papers are those that are characteristic of an influenzal infection which, after weakening the normal resistance of the nervous system, leaves the field free for the invasion of parasitic germs, normally contained in the various cavities of the body. Nor is it surprising that some investigations have resulted in demonstrating the presence of streptococci and of tetragenus and "for reasons just pointed out."

The bacillus of Pfeiffer not having been found, our author asks: Of what value would have been the finding of this bacillus other than an additional argument in favor of a diagnosis founded on the clinical and epidemiological data described? In a footnote, the author cites the fact that the bacillus of Pfeiffer had been found by Lieutenant Colonel Marantonio and Professor De Blasi in the recent epidemic among the seamen at Venice; while Professor Sestini had not found it either by direct examinations of the sputum or in blood cultures; the latter found diplococcic forms dominating the field in the sputa. As for the duration of the disease, the author quotes from Netter, who says of influenza that "*the disease generally comes to an end on the fourth day.*" "The disease, on account of its occurring at all seasons of the year and because it is not unknown even in the tropics, it seems unnecessary to create a new name of '*influenza estiva*' for it."

In conclusion, our author remarks that if this last epidemic of influenza is different from the small circumscribed endemics, occurring every year, owing to greater diffusion, the epidemic of 1889-1890 might be termed the true influenza (*influenza vera*) while the others might be given the name of *influenza nostras*, as is done in the case of cholera.

"If," our author continues, "as is the case with cholera, *influenza nostras* differs from the great pandemic of influenza, besides in the epidemiological points, also by a diversity of the infectious germ, the bacteriological data, at present available, would still leave the question undecided."

H. G. Beyer.

A Rapid Cure of Hysterical Symptoms in Soldiers, by A. F. Hurst, M.A., M.D., F.R.C.P., and I. L. M. Symns, M.A., M.D. *The Lancet,* August 3, 1918, p. 139.

The authors cite a quite remarkable series of cases illustrative of their claims implied in the title of their paper. It would, indeed, seem as if increased experience in the treatment of the hysterical symptoms which form one of the largest classes of war neuroses has led to gradual simplification of methods and increasing certainty and rapidity of cure. Their earlier experiences had made them realize that recent cases could generally be cured quickly and completely by a variety of methods, including simple persuasion and reëducation, suggestion with the aid of electricity under hypnosis or light anesthesia. But occasionally improvement was slow and incomplete. Even in hysterical aphonia and mutism

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which almost invariably disappeared after a few minutes' treatment, sometimes after lasting a year or more, the more serious speech defect was often followed by a stammer which might require careful reëducation for several weeks before complete recovery occurred. Their more recent experience has taught them that the prolonged reëducation is unnecessary; the authors now express themselves as disappointed if complete recovery does not occur within 24 hours after commencing treatment, even in cases which have been in other hospitals for over a year.

One of the strongest principles in treatment advocated by the authors appears to be the insistence of carrying the treatment to completion in the first session. This becomes quite apparent from the following quotation: "If a man with severe hysterical paraplegia of many months' standing is taught to walk in half an hour, and treatment is then discontinued on account of his fatigue, although his gait is stiff and unsteady, he will probably not walk normally until he has undergone reëducation for several weeks. But if the officer in charge not only ignores the patient's fatigue, *but also his own*, and continues the treatment for another half-hour or hour, or even for two or three hours, the patient will end by walking with a normal gait . . . In the same way a mute or aphonic soldier, who stammers on recovering his voice, should not be left until the stammer is also cured, or he will only recover completely after receiving daily lessons for some weeks."

A correct diagnosis, to begin with, is, very naturally, all important. Relapses are said to be rare, especially when patients are kept under hygienic conditions for two or three weeks, as they would be in country hospitals. "So far as we know, relapses have not occurred after discharge, except during air-raids among men living in London!"

The essential points in the treatment of the authors are: (1) that they have given up hypnotism and only rarely employ suggestion with electricity; (2) that they employ simple persuasion and continued reëducation with manipulation. "But an all-important preliminary is the creation of a proper atmosphere. After admission the sister encourages the patient to believe that he will be cured as soon as the doctor has time to see him. If paraplegic or mute, two or three patients in the ward who have been rapidly cured of paraplegia or mutism tell him of their cure. The medical officer sees him some hours later and, after examining him and coming to the conclusion that the condition is hysterical, he tells him, as a matter of course, that he will be cured the next day. By the following morning the patient is fully convinced that the hoped-for cure will take place. As the medical officer is equally convinced, the two essentials for recovery are present. . . . Simple persuasion has the great advantage of making the patient take an active part in his own cure."

Of the 13 cases cited in illustration of the cures obtained by the authors' method of treatment of the hysterical condition we must limit ourselves to quoting merely the headings:

1. Hysterical paraplegia of 8 months' duration following shell shock cured in half an hour 14 days after being awarded a 100 per cent pension for total incapacity.

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2. Hysterical paraplegia, talipes tremor and stammer of 14 months' duration cured in one day.

3. Hysterical gait and swaying movement and nose-wiping tic of 6 months' duration following shell shock cured in two hours.

4. Hysterical paraplegia of three months' duration following shell shock cured in 20 minutes.

5. Hysterical paraplegia following trench fever and complicated by malingering; mistaken for primary lateral sclerosis; cured by persuasion after persisting for three months.

6. Hysterical tremor and stammer following shell shock cured in one day seven months later, 25 days after being awarded 100 per cent pension for "total incapacity."

7. Hysterical paraplegia and tremor of jaw and limbs following shell shock cured in one day after lasting 16 months.

8. Tremor of jaw of three months' duration cured by six hours' continuous treatment.

9. Tremor of hands greatly improved in one day after lasting 13 years.

10. Hysterical nodding movement and coarse tremors of the head and arms following exposure to shell fire cured in an hour after lasting 5 months.

11. Hysterical paraplegia and generalised tremors for three months cured by manipulation and suggestion in half an hour.

12. Hysterical monoplegia and tremor following a mercurial injection cured in a few minutes after lasting for three months.

13. Hysterical "main d'accoucheur" and anesthesia following concussion of median nerve by gunshot wound of forearm cured by manipulation and persuasion in ten minutes after persisting for eight months.

H. G. Beyer.

Bone and Joint Lesions of Yaws with X-Ray Findings in Twenty Cases, by 1st Lieut. Herman G. Maul, M.C., U.S.A. *The Philip. Jour. of Science* (B. Tropical Medicine), Vol. xiii, No. 2, March, 1918, p. 63.

The author's experience is based upon an examination of a group of one hundred cases of yaws, selected from the barrios of Las Piñas and Paraaque. The diagnoses of these cases were made from the histories, clinical symptoms and the demonstration of *Treponema pertenue* under the dark-field microscope. Twenty per cent of these cases suffered from bone or joint lesions. These lesions showed rarefied areas, their size varying from the smallest discernible areas to two or three centimeters in length. The rarefaction presented moderately well-defined borders separating it from the unaffected bone and varied in translucency from a slight differentiation of unnatural transparency to one simulating a perforation. The joint pains complained of, so the author concludes, are due to the presence of these lesions on the articular surfaces.

The bone lesions of yaws may simulate (1) tuberculous or septic central abscess, (2) gumma, (3) hydatid cyst, (4) benign cyst, (5) fibrous osteitis, (6) enchondroma, (7) endothelioma, (8) secondary carcinoma, (9) myeloma and (10) sarcoma. "The differential diagnosis can be made by combining the radiographic

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appearances with all clinical data, including the history, physical signs and evidence of disease or tumor in other parts of the body. A table gives the relative percentage distribution of the lesions in different parts of the bony system. Some of the literature has been consulted. Castellani's mixture was used in treatment and in three cases salvarsan was given intravenously. The histories of 10 cases are given in detail.

The conclusions drawn by the author are as follows:

"1. The majority of cases of yaws with bone and joint involvement shows characteristic X-ray lesions.

"2. The radiograph can be used as an additional means of differentiating yaws from syphilis, when there is involvement of the bone, and as a confirmation of the evidence that the two diseases are distinct.

"3. The pains complained of in the joints are due, in most part, to the presence of the lesions on the articular surfaces.

"4. Twenty per cent of patients infected with yaws develop bone or joint lesions when not treated.

"5. Regeneration of the bone is complete at the site of the lesion, if the destruction has not been too great.

"6. The Castellani treatment causes a gradual disappearance of the bone and joint lesions.

"7. Salvarsan is a specific in these cases, and rapid regeneration of bone follows its use."

H. G. Beyer.

"Botulism" and Heine-Medin Disease, by F. G. Crookshank, M.D., Lond., M.R.C.P., Lond. *The Lancet*, **May 18, 1918, p. 699.**

It appears that quite a little stir has been caused in medical circles in Great Britain on the subject of an epidemic, called "botulism." The gist of the contention is summarized very briefly in the opening paragraph of the author in which he says: "It may be asked without frivolity, whether the use of the word 'botulism' in connection with the cases now attracting such general attention is not equivalent to the traction of an alien and enemy comestible, though not a red herring, across a profitable line of clinical inquiry. Reflection, and the experience of the last two weeks, I think, must have convinced most people that, as has been thought by some of us from the first, the various cases now under observation are clinically indistinguishable from the various 'types' of polio-encephalitis, or, more accurately, meningo-myelo-encephalitis, that are exemplified in epidemics of the Heine-Medin disease . . . at the worst, it is probably only premature to say that no 'type' of Heine-Medin disease is without its compeer in London today." So far, the author states, no bacteriological proof has been forthcoming that any of the *present* cases are due to bacteriological infection or to intoxication by the products of bacterial activity, whether associated with food consumption or not.

In so far as concerns the question of *pathological identity*, the author states that there is no discrepancy in the postmortem findings nor in the results of

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investigations of the blood and cerebrospinal fluid, he insists, however, upon further attention being paid to (1) the application of serum tests; (2) the transmission of the disease to apes; (3) the identification of the Flexner bodies, or of Rosenow's streptococcus; and (4) the accumulation of blood count records showing the leucopenia described by Eduard Müller, or the other blood pictures described by American authors.

So far as concerns the *relation of food consumption* to the epidemic, the author states that "it cannot be honestly said that there is any conclusive evidence that any general class or particular example of food have been implicated."

As to the question of the *clinical identity of the epidemic* with the Heine-Medin disease, a disease constituted by a variety of symptom-groups, occurring sometimes sporadically, sometimes widely distributed epidemically, the author seems to hold that it is not so much through a study of sporadic cases with different syndromes, impressed upon the disease by individual characteristics, as through a study of cases during an epidemic that we may best realize the pathological unity of the diverse symptom-groups "*due to the same exogenous virus.*" From a study of ten cases by the author and seeing at least forty others of which some had been diagnosed as "botulism" and some not, he found that they all corresponded to either one or the other type of the Heine-Medin disease, as seen in epidemics.

As to what the author has to say in regard to "Clinical Types" his remarks appear to the reviewer of general as well as specific application:

"It is impossible not to admit that the symptomatology of different cases depends on the *localization* of the 'foyers' of greatest intensity of the morbid processes at work at the time of observation. Hence it is possible to give a kind of topical classification of *single* clinical pictures, and to speak of encephalic cases, ponto-bulbar cases, spinal cases, meningitic cases, etc. But in particular individuals the localization of foyers of maximum intensity itself varies with stages of the disease . . . Hence the difficulties in *precise* clinical classification; not of pictures but of cases. Nevertheless, certain composite impressions tend to emerge . . . so in the present series of cases there are analogues of the various 'types' seen in true epidemic Heine-Medin disease."

Under the caption "The question of diagnosis," our author asks: "*Has sufficient care been taken by the employment of strictly scientific and experimental methods, to make certain that none of the cases of so-called Landry's paralysis—none of the cases of cerebrospinal meningitis in which no pathogenic organism has been definitely implicated, and none of the toxic cases of polyneuritis—which have occurred and still occur amongst troops in the field—are examples of Heine-Medin disease?*"

But we may end our review of this interesting paper by quoting the author's remarks on page 702: "Since these notes were written the position has become more clearly defined. The present cases, it may be asserted, are cases of Heine-Medin disease. The outbreak is, epidemiologically and clinically, identical with the great epidemic in New York of 1916. It has been brewing up in London since last autumn. All ages are affected, and the cases are of every grade of severity and of every clinical variety"

H. G. Beyer.

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Note sur la grippe (dite espagnole) qui sévit en Suisse, by Jules Renault. Bulletin de l'Académie de Médecine, 3e série, Tome lxxx, No. 31, Séance du 6 Août, 1918, p. 153.

From the above account we derive the impression that Switzerland, during the month of August, was in a state of great alarm over an epidemic, variously attributed to diphtheritic bronchitis, typhoid, cholera and plague. The rapid spread of the epidemic, the suddenness of its onset, the frequency of pulmonary complications, frequently fatal in a few days, inflamed public imagination. The public schools, schools for recruits, theaters, cinemas, concert halls were all closed; all sports, shooting exercises, calls for mobilization, public meetings, even religious, were suspended. It was not until both physicians and the authorities of state had succeeded in spreading circulars among the public, that tranquillity was, finally, reëstablished and the disease recognized as "Spanish grippe."

Clinically, the disease presents all the symptoms of grippe: sudden onset with febrile temperature, headache, general malaise, irritability of the upper air passages, throat and trachea; recovery after 3 or 4 days, leaving the patient in a state of asthenia. Pulmonary complications are not rare. Scarlatinal eruptions, purpuric spots, nasal and uterine hemorrhages occur.

Bacteriological examination has demonstrated the presence of the bacillus of Pfeiffer; it was not found in pulmonary complications in which the pneumococcus, sometimes as a diplococcus or in chains, was in evidence. These clinical, anatomo-pathological and bacteriological examinations recall, in their results, those that had been arrived at several months ago in Italy, Spain and France and wherever grippe existed.

In spite of its great diffusion, grippe is relatively not a serious disease, according to our author, and against which quarantine measures would be unjustifiable and useless. Proper care of nose and throat, avoiding to visit those sick with the disease, non-attendance of mass functions will all minimize the risks of pulmonary complications.

H. G. Beyer.

On a Method of Preparing Medium for the Culture of Pfeiffer's Influenza Bacillus, etc., by John Matthews, M.B., B.C., Camb. *The Lancet*, July 27, 1918, p. 104.

The method makes use of blood digested by trypsin and is described as follows: "Quantities of 0.25 c.c. of Allen and Hanbury's trypsin compound are added to tubes containing 4.75 c.c. of sterile broth. The mixture is then incubated for twenty-four hours and any contaminated tubes discarded. One cubic centimeter of blood from a venipuncture is then introduced into each tube and the mixture of trypsin, blood, and broth is incubated for three or four days. The product is then ready for use and is mixed with agar, as if making ordinary blood agar, in the proportion of 5 c.c. of trypsin blood mixture to about 30 c.c. of agar."

One of the advantages, the author states, is that any blood cultures that may prove sterile, form ideal material for the medium in question, instead of

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being a waste product. "The blood used need not be fresh, but may well be citrated blood . . . Indeed there is some advantage in using citrated blood, as the trypsinization seems to proceed more rapidly when citrate is present than when fresh blood is used." The medium is spoken of as to a marked extent selective, inhibiting pneumococci entirely and in a large measure streptococci and other Gram-positive organisms, but favoring apparently staphylococci.

The bacilli, as a rule, are typical but not infrequently they appear in the form of long filaments. A dozen typical cases were observed by the author. These are characterized by "sudden onset, fever of 103–104° F., prostration and malaise usually with no symptoms of catarrh and followed by rapid and usually complete recovery, though in some the malaise has tended to continue.

The author states that he has discovered Pfeiffer's bacillus in every one of his cases. He makes use of a post-nasal swab, planting them directly on to plates of his trypsinized blood-agar. In cases in which catarrh was present, he found the bacillus in bronchial and nasal mucus, together with varying quantities of pneumococci and streptococci. He feels confident that "if this medium be used and, especially, if the post-nasal space be explored, Pfeiffer's bacillus will be found universally associated with the epidemic.

As both pertinent and timely and, with due apology to the *Lancet*, we take the liberty of reproducing here in full: Annotations: Bacteriology of the "Spanish Influenza." abstracted from "Der bacteriologische Character der 'Spanischen Krankheit." Deutsche med. Wchnschr, 1918, xliv, 775 and 808," and "Editorial Notes, Münch. med. Wchnschr., 1918, lxv, p. 804;" *The Lancet*, August 10, 1918, p. 177; the original papers not being available for the reviewer:

"BACTERIOLOGY OF THE 'SPANISH INFLUENZA'

"The pandemic of influenza has not spared any single part of Germany. The clinical course does not seem to differ from that run by the disease in this country. Relapses and fatal pneumonias are particularly noted. The clinical picture is declared to be identical with that of the last pandemic of 1889. A very striking observation has been brought forward and generally confirmed at a special meeting of the Munich Medical Union on July 9—namely, that persons under thirty years of age mainly fall victims to the disease; this was explained by a survival immunity in the elder generation. The meeting considered all the aspects of the epidemic on the basis of the hospital and university material of Munich. Pfeiffer's bacillus has been found but exceptionally; streptococci, and occasionally pneumococci, were recovered from the sputum, organs, and also blood of the patients. Similar findings were recorded in 1889, and thus the present results were in 'keeping with precedent.' Pfeiffer's bacillus had not been found until 1892, although it should have been impossible to overlook it in 1889, thus it may be that it will yet turn up in due course. The editors of the *Deutsche medizinische Wochenschrift* have addressed a circular inquiry to all the leading bacteriologists in Germany requesting enlightenment as to the results of their laboratory investigations. Pfeiffer himself had reserved his final opinion as to the relationship of the pandemic and with those of 1889 and 1891–92. He had not examined a sufficient number of cases at Breslau, but found his bacillus in

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some while failing to recover it from others, and was still investigating the causes of this discrepancy. Gruber answered from Munich very simply: 'Influenza bacilli not found hitherto—investigations proceeding.' Ulrich Friedemann, who is in charge of the infections wards of the Virchow Hospital of Berlin, expressed his belief that the symptomatology and complications of the epidemic correspond exactly with those described in 1889–90. He had not found the Pfeiffer's bacillus, streptococci and pneumococci being the most common agents of the complicating pneumonias. The influenza bacillus may be evading capture on account of faulty method of inquiry, yet on the other hand the possibility must not be overlooked that there may be epidemic diseases clinically resembling influenza of which the Pfeiffer's bacillus is not the agent. Uhlenhuth has so far reported from Strassburg the same contradictory results as those of Pfeiffer. Kolle reported under the date of July 18 from Frankfort his failure to detect Pfeiffer's bacilli in any of the few cases which he had thoroughly examined. In practically all cases there were found, however, large numbers of a Gram-positive coccus—often in a pure culture or in symbiosis with pneumococci. The diplococcus tended to develop involution forms and to grow in very long chains in the condensation water. He regards them as agents of a secondary infection in the 'Spanish disease' which to his mind may not be identical with the pandemic influenza of 1889–1893. The finding of this pleomorph Gram-positive diplococcus is very interesting in view of the observations of Rosenow and his pupils in the United States."

H. G. Beyer.

"Note sur la spirochétose broncho-pulmonaire (bronchite sanglante)," by Dr. H. Violle. Bulletin de l'Académie de Médecine, 3e ser., Tome lxxix, No. 22, Séance du 4 juin, 1918, p. 429.

It is becoming clearer from day to day, as we pursue our studies of medical war literature from the different medical centers of Europe, that one of the outstanding realities which we will have to meet and prepare for, in the near future, is the importation of exotic microbes and other pathogenic agencies, due to the unprecedented traffic in infected human beings from one part of the world to another, to be thrown into the great incubator or "boiling pot" of the battlefields of Europe. The discovery in France, reported by Dr. Violle, of the recent presence there of the *Spirochaeta bronchialis*, first seen by Castellani in India more than ten years ago, is but one more instance in point.

Dr. Violle states that, during the first three months of 1918, he had occasion to treat 30 cases of this disease in the naval hospital of Saint Maudrier at Toulon and that the most interesting characteristic of this disease is the presence of blood in the expectorations: the expectorations are of a uniform rosy color, viscous and resemble grape juice; in no other affection is this coloration so characteristic that it alone is sufficient for making a diagnosis, as in this disease; therefore Dr. Violle has distinguished this variety of spirochetosis by giving it the name "*bronchite sanglante.*" Half of the cases entered the hospital with the diagnosis of "phthisis" or as suspects of it. In no case, however, could the presence of the

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B. tuberculosis be demonstrated; films stained with silver nitrate, according to the method of Fontana, modified by Tribondeau, revealed the presence of innumerable spirochetes of all forms and all dimensions, some long and fine, others thick and short, some with short and thick spirals, others with fine and long spirals; sometimes in pure culture, at other times associated with other microbes, never, however, with any of the parasitic mushrooms, such as *Paragonimus Westermani*, which is known to be a frequent cause of hemoptysies. The spirochetes appear and disappear with the disease; they cannot be found in nasal mucus, in the blood or urine; blood examinations indicate slight anemia.

The disease is described as relatively benign, insidious in its onset, no headache of any severity, pulmonary symptoms slight, often an ordinary bronchitis is present, sometimes apical, sometimes there is congestion of the bases. The expectorations are often abundant, regularly bloody. Duration of one month; relapses are frequent.

The disease is very contagious and was imported into France, according to Violle, in all probability, by Asiatics soldiers as well as workers, from China and India, and by troops having spent some time in the Levant (Macedonia and the Greek isles). It seems to become readily acclimated, at least in the south of France, and one-fourth of the cases, observed by Violle, were Frenchmen. The disease often mimics a beginning tuberculosis and may be complicated by it as well as by pneumonia; hence the diagnostic importance of the discovery in the expectorations of the spirochete. "The '*spirochætophores*' are dangerous to themselves, as susceptible to other more serious affections and to others, from representing a source of contamination."

H. G. Beyer.

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BOOK REVIEWS

Medical War Manual No. 3—Military Ophthalmic Surgery, by Allen Greenwood, M.D., Major M.R.C., U.S.A., including a chapter on Trachoma and Other Contagious Conjunctival Diseases by G. E. De Schweinitz, M.D., Major M.R.C., U.S.A., and a chapter on Ocular Malingering by Walter R. Parker, M.D., Major, M.R.C., U.S.A. Philadelphia and New York: Lea and Febiger, 1917.

The first section covering military ophthalmic surgery proper, written by Dr. Allen Greenwood, was based on his experiences with the Harvard Surgical Unit, British Expeditionary Force, General Hospital No. 22 in France, and consulation in the surrounding base hospitals. It was found that about 10 per cent required immediate or subsequent eye treatment and examination.

In the chapter dealing with penetrating wounds of the globe of sufficient severity to demand enucleation, he advises, at the least, suturing of the cut muscles and, preferably, implantation of fat or glass globes. Should there be orbital cellulitis or other contraindications of enucleation, evisceration is advocated.

Magnet operations are taken up, clearly described and their field defined.

In the chapter on traumatic cataracts, due to non-penetrating injuries, with increased tension, use miotics, while a dislocated lens should be removed, if possible. With partial dislocation, the author considers it better surgery to leave it alone.

Penetrating wounds of the orbit, with subsequent gas bacillus infection, were reported. Careful localization by radiographs is necessary in all these penetrating and perforating injuries, since it was found that foreign bodies, apparently orbital, had entered the cranial cavity. Dr. Greenwood feels that one of the most important functions of the ophthalmic surgeon consists in examination for eye signs in cranial injuries. He believes that each base hospital should possess trial frames and cases, so that emergency refraction can be done, but that, to do ophthalmic surgery properly, a special hospital should be established so that men with seriously wounded eyes can have the care necessary in such cases, and that in addition the beginning of reconstruction can be undertaken.

The second section of this little manual treats of trachoma and the common forms of conjunctivitis, and was written by Dr. E. G. de Schweinitz. After reviewing briefly the history and distribution of trachoma, he takes up the clinical varieties and divides chronic trachoma into papillary, follicular and cicatricial; and reviews briefly the symptoms and course, as well as the complications and sequelae. The diagnosis depends chiefly upon the clinical signs and must be dis-

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tinguished from vernal conjunctivitis, Parinaud's conjunctivitis, and, rarely, tuberculosis of the conjunctiva. More commonly there may be difficult in differentiating from folliculosis or follicular conjunctivitis. The author divides the treatment into medicamental, mechanical, chemical and operative procedures.

Under the chapter on acute conjunctivitis he takes up in detail acute contagious conjunctivitis, commonly known as "pink eye," and, in addition, gonorrheal conjunctivitis, and in the treatment of the latter advises the following: First, constant application of ice compresses, which in the early stages are to be continuous, but, as the inflammatory process subsides, may be employed for periods of from twenty minutes to half an hour, every three or four hours. Second, irrigation of the conjunctival sac with sufficient frequency to wash away the accumulating pus with bichloride of mercury, 1 to 8,000, cyanide of mercury 1 to 5,000, or saturated solution of boric acid. Third, frequent instillations of 25 per cent argyrol, or 10 per cent protargol; in addition, once a day, evert the lids and paint the conjunctiva with 2 per cent nitrate of silver solution, thoroughly neutralizing with physiological salt solution. Protection of the other eye with Buller's shield. Thorough and careful destruction of all discharges, stained cloth or dressings, isolation of patient, separate treatment bottles, etc.

The third section of this manual provides extremely useful material under the heading: "Examination of Malingerers," written by Dr. W. R. Parker. He divides this class of cases into: First, those who claim total loss of vision in one eye; second, those who claim partial loss of vision in one or both eyes, either group of which may have normal acuity of vision, or may exaggerate a defect actually present. Thorough examination by oblique illumination and the ophthalmoscope, as well as careful estimation of any error of refraction, should be done. He advises then the prism tests, testing with colored glasses and letters, testing with trial glasses, using a plus six before the sound eye, type placed very close to the eye, gradually increasing the distance until it is beyond the focus of the eye covered by the glass. A stereoscopic test is also recommended, as well as testing the reaction of the pupil to light. Class "B" cases, those with partial loss of vision, are somewhat more difficult to detect, prism tests are not applicable, but with a mirror so arranged that, while it is alongside of the chart, it reflects letters placed over the head of the suspected malingerer, and will thus double the distance of the direct letters.

Taken all in all, this is a very useful manual and, considering the small size, it is hard to see how any more data could be given.

G. B. Tribler.

War Surgery and Medicine. Washington, March, 1918, Vol. I, No. 1.

When the student contemplates the valuable additions made to contemporaneous medical history, now in the making, on the great battle-

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fields and field laboratories of Europe; when he reflects on the regrettable slowness of the rate of dissemination of this newly acquired knowledge, daily and hourly gained, dug out as it were, by workers in the mines of experience; and then compares this with the wonderful rapidity with which other war news is flashed through space and reproduced in the daily papers of the world, merely to satisfy public curiosity or to create public opinion, he will begin to realize and to appreciate the motive behind the present effort, set on foot by the Surgeon General of the Army, to issue a limited number of up-to-date pamphlets, devoted to abstracts of war-medical literature, with a view to placing his officers in possession of a much needed knowledge, but recently acquired, and to enable them to put it into practice before the end of the war, when most of such knowledge must, naturally, become ancient history and be lost to our soldiers of today.

Every field surgeon having had the good fortune of living and working through the last three years and a half of the war, whether in the trenches or in base hospitals, will admit, unhesitatingly, the astounding improvements medical and surgical treatment of the wounded, and sanitation in general, have undergone since the beginning of the war, and these improvements are, in great part, due to the prompt interchange of the experience of the individual medical man with that gained by his fellow-worker in the same line, through the medium of medical journals and periodicals; in other words, through educational means and methods, still the acknowledged, most powerful organs employed in the prevention of misfortune, through ignorance. Especial censors of wide experience and mature judgment for the purpose of separating the "wheat from the chaff" may still at times be of some use

It must be frankly admitted that the Surgeon General has made no mistake in his selections for the first pamphlet of a promised series, in that he gives from Maj. George de Tarnowsky, "The Surgery of the Zone of Advance"; "Gas Gangrene"; "Trench Feet"; the "General Principles Guiding the Treatment of Wounds of War," four of the most vital topics of interest to the military surgeon of today. Such a pamphlet, notwithstanding its prominently descriptive features, it would have been impossible to produce, without the accumulated, well-assimilated and discriminating experience and judgment, acquired in the field and under actual war conditions The information it conveys will meet with and supply an urgent demand on the part of all medical officers

H. G. Beyer.

Comtes Rendus de la Conference Chirurgicale Internalliée pour l'Etude des Plaies de Guerre. Arch. de M decine et de Pharmacie Militaires, Tome lxviii, Nos. 1, 2, 3, Juillet-Août.-Sept., 1917. Pp. 511.

A truly monumental work of the greatest value to the profession, as well as of undoubted historical importance; it represents a model for

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recording facts with precision and conciseness; a book for present intensive study as well as future reference.

It would be difficult to mention a subject in military surgery that has not been discussed and brought up to date, in the report, considered from all points of view and by the most eminent specialists in the profession. As mentioned by Justin Godart, at the opening of the conference, March 15, 1917, at Paris, it was, indeed, not the discussions of doctrines of the theories held by opposing schools, nor of the personal victories that had brought the delegates from the different countries together, but rather the voluntary, common desire for a systematic and methodical examination and reciprocal exchange of their personal, actual experiences and observations. With the rarest exceptions, this plan was adhered to throughout the entire conference. The reporters all brought their best—the meat, as it were—to market, with just sufficient of literary diluent to make it agreeable and interesting for assimilation.

The student of these reports is loath to lay them aside before having read the last word: Exact and concise recording of facts, stripped of all unnecessary trimmings, in these busy times is rapidly assuming the value of a distinct virtue for the recorder, as it long since has been one of the greatest desiderata on the part of the student.

H. G. Beyer.

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CLINICAL AND LABORATORY NOTES

A PERSISTENT DIPHTHERIA CARRIER[1]

By Major H. C. ERNST, M. C., U. S. A.

The notes in regard to this case may be of interest in the treatment of persistent diphtheria carriers.

On March 4 a private at one of the posts in the Northeastern Department showed, among other findings, a positive throat culture for diphtheria. All other members of his squad were discharged by negative cultures in the course of a week. For five consecutive cultures, covering a period of seven weeks, positive results were obtained in the first case.

On April 24, pure cultures were tested for virulence, and the strain was found to be virulent in high degree.

After two more positive cultures, it was recommended that a careful examination be made of the nose and air passages, to discover, if possible, some focus for the development of these persistent diphtheria bacilli. The report of the laryngologist indicated considerable congestion of the pharynx and of the tonsils; without, however, such condition as would indicate operation.

On May 24, after a previous positive culture, it was recommended that separate cultures be taken from the various organs in an effort to discover the origin of the diphtheria bacilli. After these cultures were made, it was recommended that the tonsils be painted with a strong solution (50 to 60 per cent) of silver nitrate.

On May 28, cultures were obtained with the following results:

1. Left posterior nares—cocci only.
2. Right posterior nares—cocci only.
3. Left nostril—cocci only.
4. Right nostril—cocci only.
5. Left tonsil—streptococci only.
6. Right tonsil—diphtheria bacilli—*positive*.
7. Left pharynx—diphtheria bacilli—*positive*.
8. Right pharynx—diphtheria bacilli—*positive*.

At this point, it was suggested that the right tonsil was the probable focus.

On June 4, cultures were again examined with the following results:

1. Left nostril—*negative*.
2. Right nostril—*negative*.
3. Left tonsil—streptococci only.
4. Right tonsil—diphtheria bacilli—*positive*.
5. Left pharynx—*negative*.
6. Right pharynx—diphtheria bacilli—*positive*.

Information was received that the treatment with nitrate of silver had been carried out, but from the preceding findings it was evidently not effective.

[1]From the Laboratory of the Northeastern Department.

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On June 12, cultures were examined again with the following results:

1. Right tonsil—diphtheria bacilli—*positive.*
2. Right pharynx—diphtheria bacilli—*positive.*
3. Right nostril—*negative.*
4. Left tonsil—streptococci only.
5. Left pharynx—*negative.*
6. Left nostril—*negative.*

A glance at these results showed, apparently conclusively, that the right side of the throat, and, presumably, the right tonsil, were infected.

It was suggested that this tonsil be removed. This was done, and on June 26, cultures were received and examined with the following results.

1. Right tonsil—*negative.*
2. Right pharynx—*negative.*
3. Right nostril—*negative.*
4. Left nostril—*negative.*
5. Left pharynx—*negative.*
6. Left tonsil—streptococci only—*negative.*

On July 6, the final cultures for release were made with the following results:

1. Right pharynx—*negative.*
2. Right tonsil—*negative.*
3. Right nostril—*negative.*
4. Left nostril—*negative.*
5. Left pharynx—*negative.*
6. Left tonsil—streptococci only—*negative.*

It is of interest to note that the left tonsil showed the presence of a practically pure culture of streptococci, as had been the case in all of the previous cultures.

1. The striking thing about all of these cultures has been the localization of the infection, as shown by the examination of a series of local cultures.

2. By this means the focus of infection was determined, and the man discharged from quarantine.

3. Undoubtedly, if this method has been pursued earlier, the period of quarantine would have been much shorter.

NOTE.—Thanks are due to my associate, Dr. C. G. Page, for aid in the details of this observation.

NOTES ON TETANUS[2]

BY LIEUTENANT NIAL F. TWIGG, A.B., M.D.
Medical Reserve Corps, United States Army

The following notes on the prophylaxis and the treatment of tetanus were given to me during my service in a British base hospital and were compiled by the War Office Committee for the Study of Tetanus:

THE PROPHYLACTIC TREATMENT OF TETANUS

From experiments, it has been found out that the immunity conferred by an injection of anti-tetanus serum is lost or is considerably lessened

[2]Delivered before Medical Officers Training Camp, Fort Oglethorpe, Ga.

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after a period of ten days, therefore medical officers in the British army have been ordered to give every wounded man at least four injections, the first injection is given at the dressing station of a field ambulance as soon as the wounded man arrives there. The dose is usually 500 units, except in some cases of very extensive wounds, when 1,000 units are given. The second injection should be given at an interval of seven days from the first dose, and the third and fourth doses should follow at the same interval of time or as soon after as practicable.

All cases of trench feet, either with or without a breach of surface, should also be given the serum, as many cases of tetanus developed in cases of trench feet.

Numerous cases of tetanus have followed operations which were performed at the site of wounds, so it has been decided to give a prophylactic injection of anti-tetanus serum—500 units preferably—two days before the operation, provided that the patient has not received an injection within seven days preceding the operation. It should be given subcutaneously or, if given twelve hours before the operation, it should be given intramuscularly.

The antiseptics which prevent the anaerobic growth of the tetanus bacillus are the oxidizing antiseptics, among which are potassium permanganate and hydrogen peroxide; also the antiseptics which depend on the liberation of chlorine, as Dakin's solution, eusol and dichloramine-T, which also render toxins non-injurious.

DIAGNOSIS

To get the best results from treatment it is necessary that the diagnosis should be made before the classical symptoms of tetanus appear. Some of those who have had a prophylactic injection of antitoxin develop tetanus, but trismus and general symptoms may not occur at all. In these cases the only symptom might be a local spastic rigidity of the wounded limb. This might disappear or develop into generalized tetanus. The motor nerve cells in the spinal cord which govern the muscles near the wound will be the first affected, which will be shown by spasticity and by increased reflex excitability of these muscles. Sometimes the patient complains of jumping or jerking or of stiffness in the wounded limb which occurs chiefly at night. Whenever the wound is dressed it is a good plan to examine the muscles near it for the presence of rigidity or twitchings; the nurses who dress wounds should be instructed to report to the medical officer if the muscles near the wound are harder or show more rigidity than the muscles of the sound side. The muscles supplied by the fifth nerve are most commonly affected, so, when trismus develops in a wounded man, tetanus should be immediately suspected.

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Often before definite symptoms develop we get an exaggeration of the deep reflexes. Knee and ankle clonus might be obtained and we also frequently get a positive Babinski reflex.

TREATMENT OF TETANUS

The success of treatment lies in an early diagnosis. Don't wait until lockjaw has developed before giving serum; 5,000 units given early in a case are more efficient than 50,000 later, when the symptoms have become general.

Four methods are commonly used for giving the antitetanus serum, namely, subcutaneous, intra-muscular, intravenous and intraspinous.

The War Office Committee for the Study of Tetanus reports that in cases of acute general tetanus the best method is to give large doses of antitoxic serum intraspinously, repeated in two, three or four days in succession and combined with intramuscular injections.

Very large doses of serum should be given; 50,000 to 100,000 units may be given during the first few days of treatment.

For the intraspinous injections it is advisable to withdraw 20 c.c. of cerebrospinal fluid and then to run in the serum, but in no case is it to exceed 20 c.c. in amount; 16,000 units is the adequate single dose for the intraspinous injection. The intraspinous dose should be repeated daily for four days, at the same time giving supplementary doses of 8,000 units intramuscularly.

Treatment by magnesium sulphate is not advised, as there is some risk attending its use and it is doubtful if it has any advantage whatever. In local tetanus without implication of the higher centers, doses of 3,000 to 6,000 units may be given daily by the intramuscular or subcutaneous routes. If the disease shows signs of extending to the higher centers, it is recommended to give at least one full dose by the intrathecal route.

SURGICAL TREATMENT OF WOUND AFTER TETANUS HAS APPEARED

After tetanus has appeared there is no advantage to be gained by excising the wound or amputating the limb; in fact it might accelerate the course of the disease.

From animal experiments it has also been shown that operative measures are useless, although more evidence is required before any dogmatic statement can be made. It appears to be safer to abstain from surgical interference with the wound until the ordinary treatment for tetanus has been carried out. When the symptoms of tetanus have subsided the wound can then be opened up and search made for pieces of shrapnel, foreign bodies, and hidden collections of pus and tetanus bacilli.

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A SEQUEL OF INFLUENZA

BY LIEUTENANT PANE R. WITHINGTON
Medical Corps, United States Army

During a recent epidemic of "influenza" a few cases (five of those under my care) have had a sequela of which, in the literature available, I can find no mention.

The first man in whom it was seen had recovered from the acute symptoms (high fever and general malaise) two days before, when he suddenly complained of sharp pains in the left upper quadrant. Physical examination was entirely negative, and I came to the conclusion that he was "swinging the lead" and sent him to a convalescent camp the next day. Shortly after this I, myself, was attacked by the germ and on the afternoon of the day on which I considered myself well, I began to have very sharp rhythmic pains in the left upper quadrant coming at short, regular intervals, and lasting a few seconds at a time; exacerbated by deep inspirations but appearing even when I remained perfectly quiet and did not breathe. The pains resembled, in their intensity, those caused by stretching of smooth muscle. At the end of about five hours they became less severe and less frequent, and gradually died away.

I was not examined physically, but since I recovered I have had three more cases whose history resembled mine, and with negative examination save for very slight tenderness over the spleen. The spleen was not palpable, there was no spasm of the abdominal muscles, and lung examination revealed nothing.

I am not prepared to assert what the cause of the pains was, but the rhythmicity suggests that peristalsis may have been a factor (there was in none of the cases evidence of colitis or gastritis), and the exacerbation on deep inspiration is also suggestive. An inflamed peritoneum would account for both phenomena.

The only other case of which I have heard was that of a young English officer who came before a board of which I am a member. He had been ill with seborrhea for five weeks in a skin hospital. While there he developed influenza, following which he had severe pains as described above. He had malaria two years before and, merely because of the pains over his spleen, which had entirely ceased, was recommended by his medical officer for three weeks' sick leave!

Summary.—Sharp rhythmic pains in the left upper quadrant of the abdomen may occur following so-called "influenza." Their origin is uncertain. Their duration is less than twenty-four hours, and, although they are severe while they last, prognosis is excellent.

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ORIGINAL ARTICLES

Authors alone are responsible for the opinions expressed in their contributions

THE RÔLE OF THE HAND IN THE DISTRIBUTION OF INFLUENZA VIRUS AND THE SECONDARY INVADERS[1]

BY COLONEL CHARLES LYNCH, M. C., U. S. A., AND LIEUT. COLONEL JAMES G. CUMMING, M. C., U. S. A.

Port of Embarkation, Newport News, Va.

(With eight charts)

WITH the mobilization of the United States Army there occurred among troops a much higher incidence of the so-called respiratory diseases than is found in civil life. This has been explained by the contact incident to the crowded conditions of the camps. But we have been led to believe from our reported investigation of measles with its pneumonic complications ("The Pneumonias: Streptococcus and Pneumococcus Groups," *Jour. Am. M. Ass.*, April 13, 1918) and from a brief and incomplete study of the method of washing mess-kits (Report of Col. V. C. Vaughan, M. C., U. S. A., S. G. O., February, 1918) that there was a major method of transmission by indirect contact in the Army, and that direct contact was only a subsidiary means of transmission.

Our study of about 900 measles cases and their post-measles pneumonias shows that the causative organisms in these pneumonias, the streptococcus and pneumococcus, were not from direct contact tion acquired in hospital, except in rare instances. Thirty-five per cent of the measles cases were hemolytic streptococcus carriers upon *entering the hospital,* and 33 per cent of these developed streptococcus pneumonia; of the remaining 65 per cent free from streptococcus

[1] In view of the uncertainty surrounding the etiology of influenza, the term "virus" has been used to denominate the causal agent. The term "secondary invaders," as used, includes the B. influenzae, the streptococcus hemolyticus and the other streptococci, and the various types of pneumococci.

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on admission to hospital, only 3 per cent developed streptococcus pneumonia. It is thus obvious that the streptococcus invasion is not usually a direct contact infection acquired in hospital. The pneumonia complications of influenza appear in the great majority of cases not later than the second day following the initial symptoms of influenza. The rate of post influenza pneumonia among our cases to date (October 15, 1918) is 12.5 per cent. Owing to the early appearance of pneumonic symptoms it is obvious that the infective agents (pneumococcus, streptococcus hemolyticus and viridans) of this complication do not arise from hospital infection, but occur, as in measles, prior to hospitalization. The early appearance of pneumonia in influenza verifies in a way our conclusion as to the time of infection in the post-measles pneumonias, namely, that the infective agents in these complications are but rarely hospital infections.

A report on the method of washing mess-kits was made from the Southern Department about the end of February, 1918. Observations showed that the amount of water used was wholly inadequate, in some organizations an amount as small as 4 gallons for 250 men. The average temperature of a large number of readings was 47° C. and the bacterial count was about 40,000 per c.c. Several counts ran as high as 150,000 per c.c. This work was carried on during January and February, 1918. These counts are about the same as average milk, but it is to be pointed out that bacteria in mess-kit wash water would naturally be those in which the human host is the carrier, while in milk this is not usually the case. Recent counts at this port run between 2,000 and 14,000 per c.c. The temperatures average about 52° C. and colon bacilli are occasionally found. The variation in temperatures and bacterial counts at this port and the Southern Department is probably accounted for in part by the difference in seasonal temperatures.

DIRECT AS CONTRASTED WITH INDIRECT CONTACT INFECTION

We doubt if there is more actual direct contact in our camps than in the large centers of population. It seems to us that the higher rates of the acute infections in the camps cannot in the main be explained by direct contact infection, for it would appear that direct contact *per se* in the camps is not sufficiently increased over that of the civil population to account for the much higher rates. Furthermore, it would seem that in some commands the rapidly increasing incidence of measles, for instance, is far too explosive in

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character to be accounted for on the theory of direct contact. Lack of immunity does not explain these outbreaks, since it must have existed in newly drafted groups prior to induction into military service.

INFLUENZA—HAND TO MOUTH TRANSMISSION

We have been struck by the explosive character of the present influenza epidemic in certain organizations at this port, while other organizations living under practically identical conditions remained comparatively free from the infection. With the possibility of hand-to-mouth or indirect contact transmission in mind, we made an investigation to determine whether or not there was a difference between the daily incidence of the infection in organizations, which were provided with mess-kits washed by the old line method and those using tableware washed in the kitchen. For the purpose of this investigation, organizations were first chosen which lived in close contact to the civil community where exposure to direct contact would be more intense than in the isolated camps.

We will first consider the Depot Q. M. C. Unit, consisting of 1,090 men, 689 of whom are messed by family style from tableware and 401 eat from mess-kits, which were washed by the usual old line method.

With the exception of two organizations all men are quartered in barracks. Those under tentage are the Fire and Guard Co. 322, 185 men, and the Mobile Laundry Co., 257 men. We will later show that the method of quartering does not influence the rate of infection. The duties of these two groups cause them to lead an equally exposed existence; in both groups the ventilation and cubic air space requirements were complied with. There was no undue fatigue in either group. In fact, observations show that, as nearly as can be determined, the mode of life and daily routine of messing of the two groups were practically the same.

DEPOT Q. M. C. UNIT

(Chart I—Table A)

This chart shows the daily incidence of the infection in the two groups per thousand of strength for a period of fourteen days. It will be noted for the period here considered: First, that the rate per 1,000 for the group eating from mess-kits is 476, while that for the group using tableware is 94, the rate in one group being five times greater than the other. Second, that there is a difference of 141 per

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1,000 between the extreme peaks of the two groups. Third, that the daily rate for those using tableware is continuously low, while for those using mess-kits there is on certain days an extremely high rate, which is explosive in character. Fourth, that the consolidated daily rates, although showing a considerable difference between the two groups, present a regularity from day to day which tends to somewhat cloud the explosive character of the epidemic in those organizations using mess-kits.

From the findings here presented it is obvious that some major factor is responsible for the explosive character of the one group of outbreaks. This is the hand. It is primarily responsible, the mess-kit wash water constituting not only the vehicle of transmission, but at the same time furnishing an optimum temperature, a fluid medium, and an intermediate conveyor for large quantities of infectious agents. If, as these observations show, the hand is responsible for the contamination of mess-kit wash water with resulting fulminant epidemics, it follows that the minor routes of transmission are by the same general rule, mouth-to-hand and hand-to-mouth infection. The hand of the typhoid carrier has been repeatedly incriminated as the transmitting agent in food-borne epidemics, this contamination resulting in explosive outbreaks similar to those here shown. Just as the contaminated hand of the typhoid carrier pollutes food or dish water, so also, and to a far greater degree, the hand of one having a sputum-borne disease soils food, intermediate objects, and mess-kit wash water. If the hand of a typhoid carrier is liable to contamination from the usual source, is it not a foregone conclusion that hand contamination in the case of one infected with a sputum-borne disease is increased many fold?

The naked hand visits the anus with relative infrequency; the mouth, on the contrary, is touched by the hand many times daily. Sputum is usually superficially wiped off on an already soiled handkerchief or the external clothing. Hence sputum contamination of the hand is far more universal than is fecal contamination of the hand. This explains the explosive character of influenza outbreaks, since the explosive character of any outbreak is dependent on the simultaneous reception of an infective agent in massive doses by a large group of people. In this instance the hand infected wash water furnishes the intermediary vehicle to other hands, which in turn carry the infection to other mouths. Without doubt convection of the influenza virus may take place through the intermediation of all manner of articles commonly handled by a large group.

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TABLE A.— *Depot Q. M. C. Unit*

Troops Using Tableware or Mess-Kits Which Are Boiled

Organization	Strength	Sept. 27	Sept. 28	Sept. 29	Sept. 30	Oct. 1	Oct. 2	Oct. 3	Oct. 4	Oct. 5	Oct. 6	Oct. 7	Oct. 8	Oct. 9	Oct. 10	Total	Total
Q. M. C. No. 2.....	218	.....	.....	.....	1	.....	2	2	.....	.....	1	1	1	.....	2	10	65
Q. M. C. No. 5.....	196	.....	2	1	2	1	1	3	2	1	4	2	3	1	3	26	
Q. M. C. Recl.....	275	2	1	.....	6	1	4	4	2	2	.....	2	2	2	1	29	
Total	689	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	

Mess Kits Washed by Usual Line Method

10th Virginia.....	112	.....	.....	3	6	12	18	4	8	7	1	1	.....	.....	1	61	191
F. & G. No. 322.....	104	.....	.....	.....	.....	.....	3	1	1	2	15	.....	2	3	1	33	
Mob. Laundry.....	185	4	22	10	14	6	10	12	10	2	1	3	1	1	1	97	
Total.....	401	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	256
Grand total	1,090																

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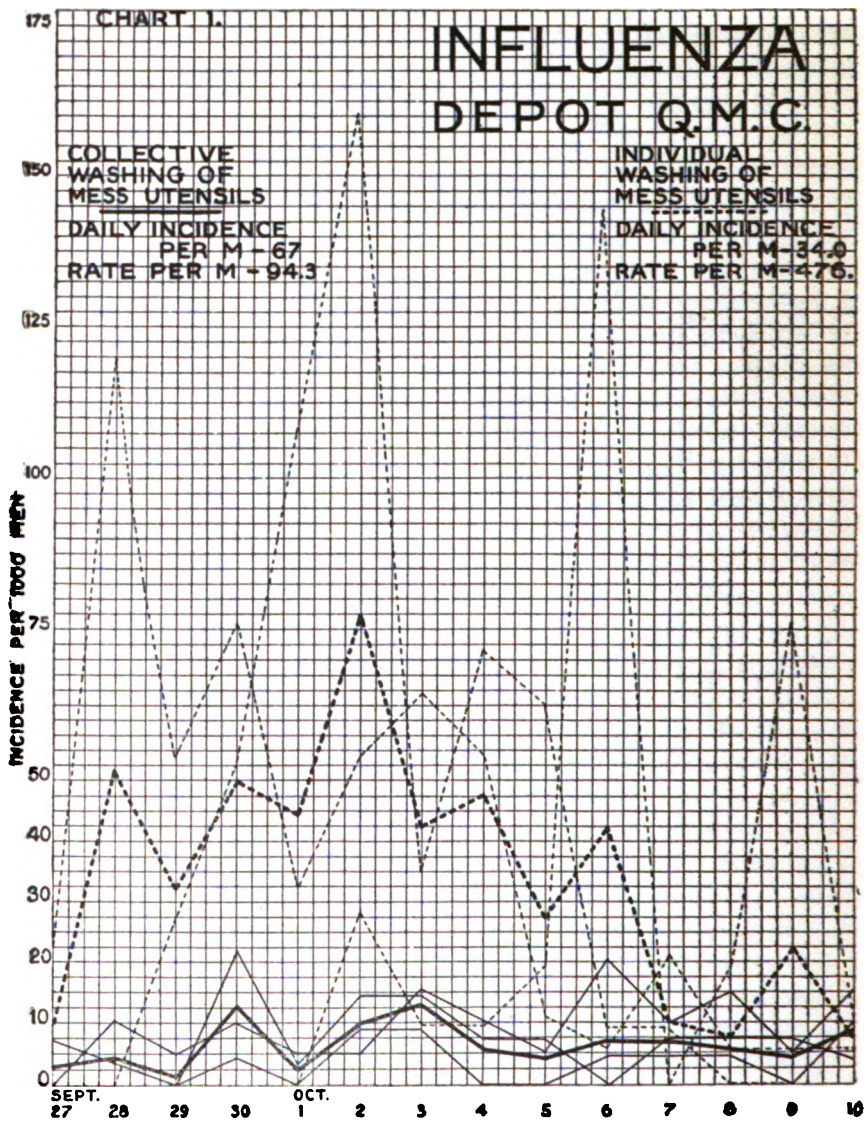

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but in this instance the character of the transmitting agent is such as to preserve inviolate the virulence of both the primary cause and the secondary invaders.

Furthermore, in military life the mess-kit wash water is the most intimate and frequent point of contact between a considerable number of individuals. The seasonal prevalence of influenza and the other respiratory diseases may be explained by the fact that the increase of the nasal and oral discharges resulting from cold weather cause the hand to seek the nose more often in winter than in summer. Cold weather, increased coughing, massive hand contamination, and increased incidence of respiratory disease, in the civil population as well as among troops, support the theory of mouth-to-hand, intermediate vehicles, and hand-to-mouth transmission. The gauze mask does not prevent infection by excluding air-carried organisms, but by reason of the fact that the wearer finds it quite impossible to place his fingers in his mouth and nose, there to become polluted with his own excretions or to introduce the discharges from some other person. The extra-corporeal viability of the pathogenic organism does not enter into the question since, even though its duration may be very brief, the supply is constantly being replenished from the mouth.

ATTENDING SURGEON'S UNIT

(Chart II—Table B)

The average daily incidence of the infection in this unit, which is composed chiefly of office forces and fire and guard organizations, shows a ratio of 3.33 per 1,000 for those using tableware to 8.88 per 1,000 for those using mess-kits. The average rate for the fourteen-day period here considered is 4.6 per 1,000 for one group and 12.3 per 1,000 for the other group. The tables show the high daily incidence for the separate organizations provided with mess-kits, while the chart shows, owing to the consolidation of all organizations into the two groups, the character of a plateau rather than peaks which are indicative of an explosive epidemic in the separate organizations.

CAMP HILL

(Chart III—Table C)

This chart, as do the others described in this report, demonstrates the plateau of the epidemic, a few cases having occurred prior to the period here considered, while comparatively few others occurred somewhat later. It will be noted that from September 27 to October

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CHART II

INFLUENZA

ATTENDING SURGEON'S UNIT

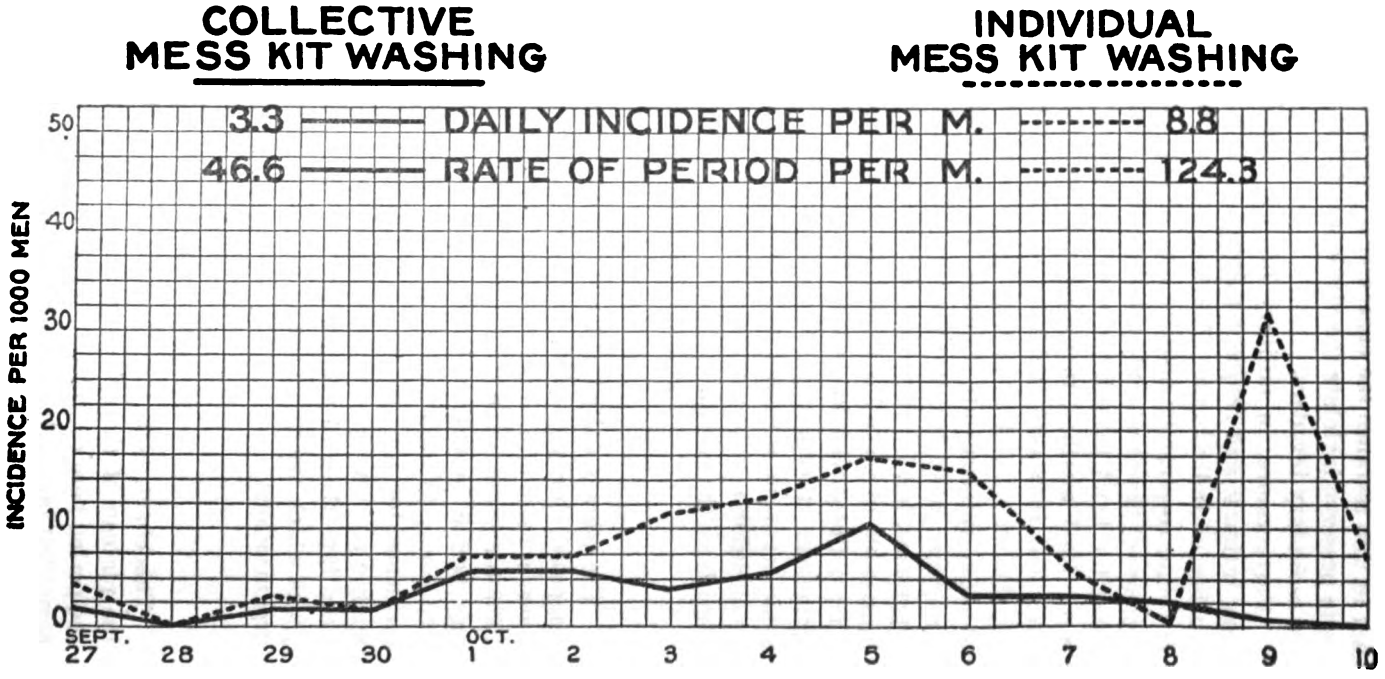

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TABLE B.—*Attending Surgeon's Unit*

Troops Using Tableware or Mess-Kits Which Are Boiled

Organization	Strength	Sept. 27	Sept. 28	Sept. 29	Sept. 30	Oct. 1	Oct. 2	Oct. 3	Oct. 4	Oct. 5	Oct. 6	Oct. 7	Oct. 8	Oct. 9	Oct. 10	Total	Total
Q.M.C. No. 1	239	.....	.....	1	2	7	6	2	6	8	1	2	2	.....	.....	37	
Q.M.C. Officers	104	.....	.....	1	.....	.....	1	2	2	1	1	1	.....	1	.....	10	
Surg. Det. M. C.	69	.....	.....	1	1	1	.....	1	.....	1	1	.....	.....	.....	.....	6	
Army F. C.	97	1	.....	.....	.....	.....	1	1	.....	2	.....	.....	.....	.....	.....	5	
Sig. Corp. 25th	36	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	
Q. M. C. F. & G.	700	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	
Cavalry Officers	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		
Medical Officers	26	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		
Ordnance Dept.	133	.....	.....	.....	.....	.....	.....	1	1	1	.....	.....	1	.....	.....	4	
Q. M. C. No. 3.	186	.....	.....	.....	.....	.....	1	.....	.....	1	.....	.....	1	.....	.....	3	
Sanitary Corps	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	.....	.....	.....	2	
Ship C. Com.	8	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	.....	.....	.....	2	
A. E. D. Officers	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1	
D. C. Officers	4	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	1	
A. G. O. Hdqs.	15	.....	.....	.....	.....	1	.....	.....	.....	1	.....	.....	.....	.....	.....	2	76
Total	1,630	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	

Mess-Kits Washed by Usual Line Method

F. & G. No. 311	257	.....	.....	.....	1	1	1	.....	4	2	2	.....	.....	9	.....	20	
F. & G. No. 323	180	2	.....	2	.....	1	4	6	3	5	5	4	.....	.....	2	34	
F. & G. No. 314	263	1	.....	.....	.....	3	.....	2	2	5	4	.....	.....	13	3	33	87
Total	700	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	163
Grand total	2,330																

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CHART III.

INFLUENZA
CAMP HILL

COLLECTIVE MESS KIT WASHING

INDIVIDUAL MESS KIT WASHING

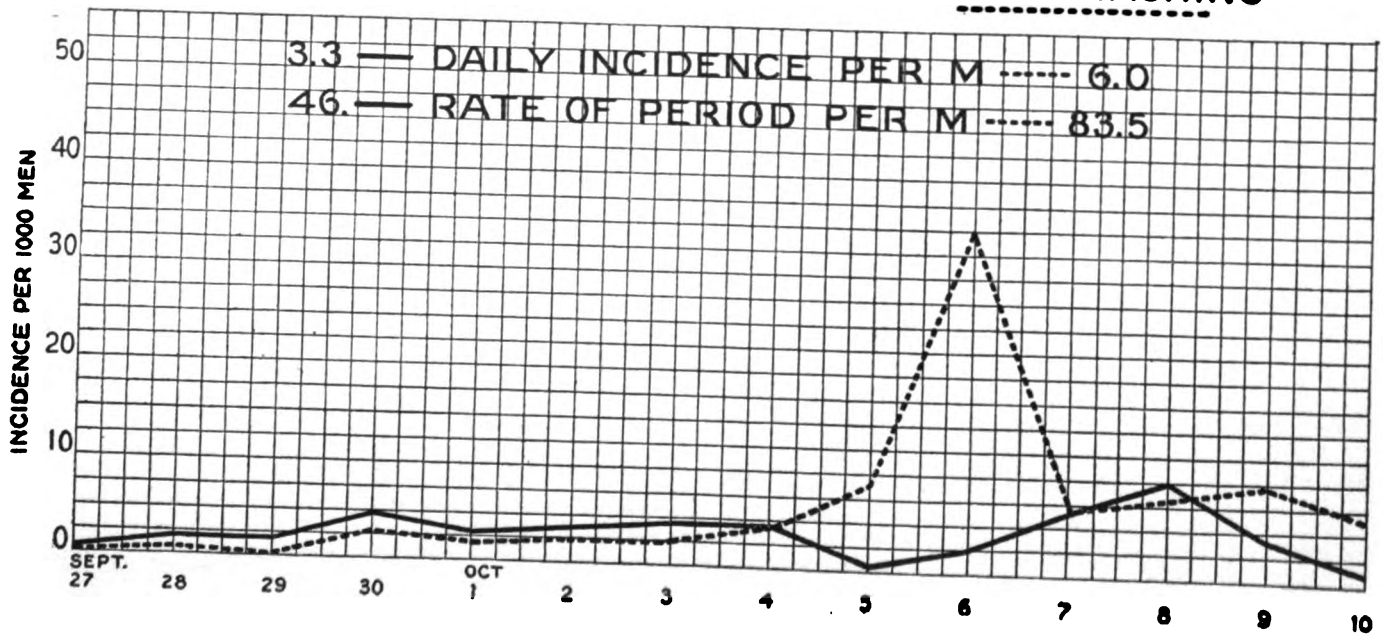

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TABLE C. —*Camp Hill*

Troops Using Tableware or Mess-kits Which Are Boiled

Organization	Strength	Sept. 27	Sept. 28	Sept. 29	Sept. 30	Oct. 1	Oct. 2	Oct. 3	Oct. 4	Oct. 5	Oct. 6	Oct. 7	Oct. 8	Oct. 9	Oct. 10	Total	Total
Q. M. C., A. E. D.	584	1			3	1	2	4	2		3	9	9	5		39	
A. E. D. No. 301	192			1	1						1	2	7			12	
Medical Det.	32				1			1								2	
M. C. Co. No. 310	46																
M. S. T. Unit 351	25																
M. S. T. Unit 386	26																
M. S. T. Det.	62																
M. T. Co. No. 356	77		1						1							2	
M. T. Co. No. 357	78		1			1										2	
M. T. Co. No. 409	73								1			1	1			3	
M. T. Co. No. 410	73				1	1										2	
Medical Det.	7				1									1	1	3	
Q. M. C. Det. No. 3	192						2	1	2	1				1		7	
M. Trans. Co. I.	128			1		1	2									4	
Med. Ware Det.	77			1					1							2	
Ordnance C.	54																
D. Aero S. 814	52		1			1		1								3	
Det. of Det.	7				1											1	82
Total	1,785																

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Mess-kits Washed by Usual Line Method

Organization	Strength	Sept. 27	Sept. 28	Sept. 29	Sept. 30	Oct. 1	Oct. 2	Oct. 3	Oct. 4	Oct. 5	Oct. 6	Oct. 7	Oct. 8	Oct. 9	Oct. 10	Total	Total
F. & G. No. 318	237	.....	.....	.....	.....	.....	.....	.....	.....	1	4	1	3	8	7	24	82
F. &. G. No. 317	231	.....	.....	.....	.....	.....	.....	2	.....	2	1	2	1	.....	.....	8	
F. &. G. No. 326	172	.....	.....	.....	.....	.....	.....	.....	7	7	4	.....	6	8	.....	32	
F. &. G. No. 320	242	.....	.....	.....	.....	4	2	2	2	.....	2	.....	.....	.....	5	17	
F. R. S. No. 331	152	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	3	
F. R. S. No. 333	148	.....	.....	.....	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	2	
F. R. S. No. 334	154	.....	.....	.....	.....	.....	.....	.....	.....	.....	4	2	.....	.....	.....	6	
F. R. S. No. 335	150	.....	.....	.....	1	.....	.....	1	.....	2	2	.....	.....	.....	.....	6	
F. R. S. No. 336	154	.....	1	.....	1	.....	2	.....	2	.....	.....	2	.....	.....	.....	8	
F. R. S. No. 337	161	.....	.....	.....	2	.....	.....	1	2	12	7	.....	.....	.....	.....	24	
F. R. S. No. 338	154	.....	.....	.....	.....	.....	.....	2	1	1	5	9	2	7	.....	27	
4th Tr. Mot. Bn	755	.....	.....	.....	.....	1	2	.....	.....	.....	74		Embarked			77	
4th Ant. Air Cft	510	.....	.....	.....	.....	.....	.....	.....	.....	2	19		Embarked			21	
11th Cav. Troop A	17	.....	.....	.....	1	.....	1	.....	2	3	.....	.....	.....	.....	.....	7	
1st Cas. Co	107	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		
2nd Cas. Co	88	.....	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	5	
3rd Casual Co	68	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		
4th Casual Co	209	.....	.....	.....	.....	1	.....	.....	.....	.....	1	.....	.....	1	.....	3	
5th Casual Co	65	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1	
6th Casual Co	127	.....	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	2	4	
306th A. A. T. D	44	.....	.....	.....	.....	.....	.....	.....	.....	1	3	2	10	.....	.....	16	
Port Utilities	70	.....	.....	.....	.....	.....	.....	1	2	1	6	.....	.....	2	1	13	304
Total	4,015	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	386
Grand total	5,800																

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4 there was a low incidence in both groups. On the latter date there was a sudden explosive incidence in the group using mess-kits. The daily incidence in the group would have continued to peak had it not been that 1,265 men, in which the daily incidence was rapidly increasing, embarked on the afternoon of October 6. The recent introduction of the virus among these troops doubtless played havoc among them during the voyage. They had arrived at Camp Hill September 25 and embarked October 6, 1918.

The relatively low daily incidence among those using mess-kits is explained by the significant fact that among the six casual companies, 704 men, included in this group, 40 per cent had been taken from the organization suffering from influenza at the time of embarkation. They received hospital treatment and were finally discharged to the casual organization as immunes. Hence the apparently low rate among those using mess-kits.

In regard to the immunity conferred by an attack of this disease, and concerning which there has been considerable discussion, it would appear from the periodic occurrence of pandemics at quite regular intervals of from four to eight years that the immunity is at least for that period.

CAMP MORRISON

(Chart IV—Table D)

This chart shows the daily rate per 1,000 for the two groups of organizations, tableware and mess-kit methods of messing. There were eighteen organizations using mess-kits and two using tableware. All troops were housed in barracks. There was no difference in the cubic air allowance per man and there was extensive intermingling between the two groups. Only two organizations had recently arrived in camp, but there is no difference in the daily rate of these when compared to the rates of other more or less permanent organizations. It will be noted in the chart that the rates for all organizations are consolidated in the two separate groups, and that, owing to this, the explosive character of the epidemic in organizations using mess-kits is not well shown. The total rates for the period here considered are, however, 147 per 1,000 for the one group and 415 per 1,000 for the other—a difference of 268 per 1,000 for the two groups. The highest rates of separate organizations in the two groups for a single day is shown by a difference of 365 per 1000. It will be noted in the tables of daily incidence that one organization using mess-kits had a low daily rate. In a sanitary report made by

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CHART IV.

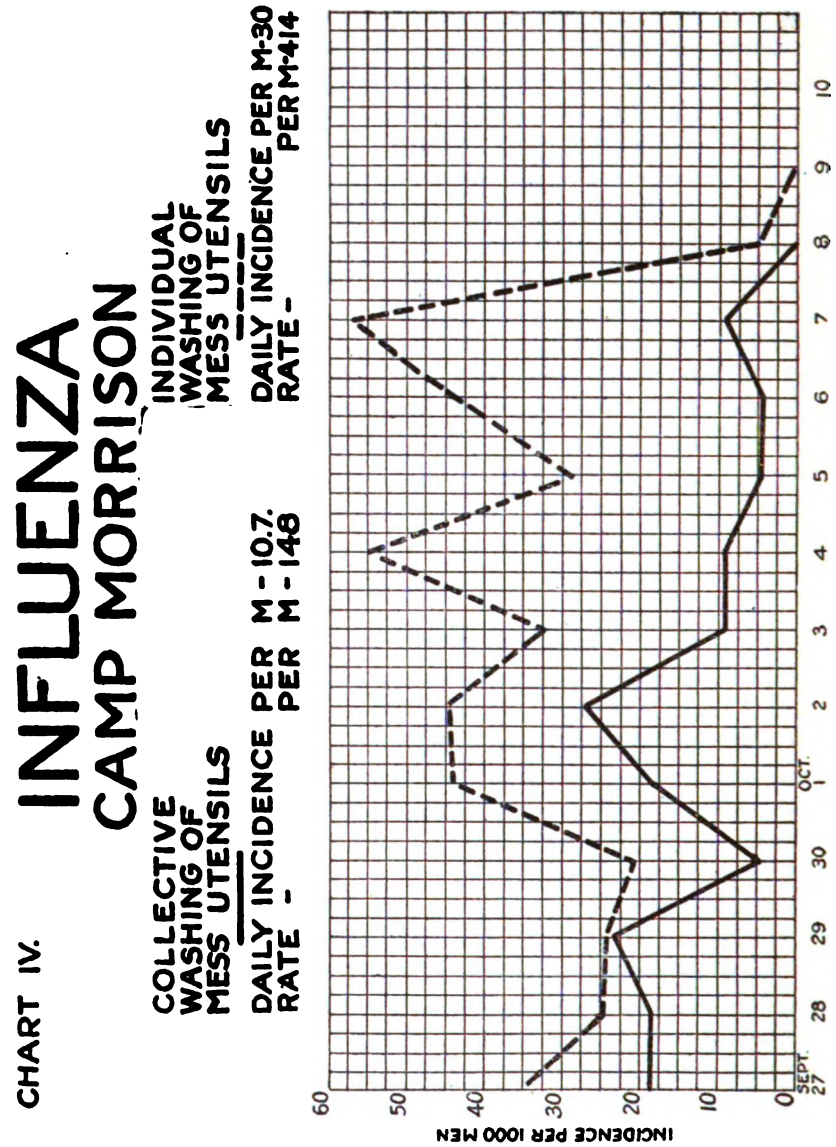

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TABLE D.—*Camp Morrison*

Troops Using Tableware or Mess-kits Which Are Boiled

Organization	Strength	Sept. 27	Sept. 28	Sept. 29	Sept. 30	Oct. 1	Oct. 2	Oct. 3	Oct. 4	Oct. 5	Oct. 6	Oct. 7	Oct. 8	Oct. 9	Oct. 10	Total	Total
Q. M. C.	100	4	4	5	.....	3	6	2	.....	.....	.....	1	.....	.....	.....	25	
Medical Det.	117	.....	.....	.....	1	1	.....	.....	2	1	1	1	.....	.....	.....	7	32
Total	217																

Mess Kits Washed by Usual Line Method

17th Bal. Co.	197	36	2	2	.....	8	6	1	4	10	.....	3	1	.....	.....	73	
18th Bal. Co.	193	22	17	.....	6	25	20	4	8	.....	19	.....	.....	.....	.....	121	
19th Bal. Co.	193	1	.....	.....	2	.....	1	14	42	27	.....	6	.....	.....	.....	93	
20th Bal. Co.	196	1	.....	1	.....	6	10	19	64	9	.....	7	.....	.....	.....	117	
30th Bal. Co.	200	.....	.....	.....	.....	.....	1	2	4	.....	53	85	2	.....	.....	147	
34th Bal. Co.	200	.....	.....	.....	1	.....	2	2	17	23	3	28	3	.....	.....	79	
36th Bal. Co.	193	11	13	27	17	14	3	.....	.....	.....	5	2	.....	.....	.....	92	
58th Bal. Co.	200	.....	.....	.....	.....	5	4	8	6	.....	36	21	4	.....	.....	84	
504th Squad.	136	1	2	.....	.....	.....	4	1	.....	.....	.....	.....	.....	.....	.....	8	
647th Squad	169	2	2	2	6	24	25	3	3	.....	.....	2	.....	.....	.....	69	
673rd Squad.	147	8	.....	18	1	3	5	6	3	.....	4	.....	.....	.....	.....	48	
674th Squad.	141	7	6	3	9	5	.....	.....	.....	2	1	.....	1	.....	.....	34	
677th Squad.	158	1	.....	.....	1	3	6	11	6	4	2	2	.....	.....	.....	36	
A. R. D. No. 1.	123	7	5	9	2	8	6	.....	.....	.....	4	3	.....	.....	.....	44	
A. R. D. No. 2.	123	4	4	7	9	6	2	5	2	6	1	2	.....	.....	.....	48	
A. R. D. No. 3.	174	1	20	2	2	1	4	1	2	.....	1	3	.....	.....	.....	37	
35th Bal. Co.	200	1	.....	.....	5	21	32	17	3	2	1	5	2	.....	.....	89	
Off.	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1,220
Total.	2,943	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,252
Grand total.	3,160																

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the camp surgeon it is found that among all the organizations this one only was rated excellent. Sanitation as here referred to includes mess-hall management. On October 5 the plan was adopted of turning in the mess-kits to the kitchen, where they were boiled. It is a striking fact that on the third day following there was a decided drop in the curve from a high peak on the preceding day to practically no cases. Furthermore practically no cases occurred later. Inasmuch as the epidemic had not run its full twelve-day plateau, it is possible that this demonstration indicates a two-day incubation period.

The duration of the plateau is much shorter among army organizations than in civilian centers of population. This further supports the evidence here presented, namely, that there is massive transmission among troops composing a single organization.

The separate large family in the city shows, as we have noted, the same character of incidence as the single army organization. The extended plateau in civil population is the consolidation of cases occurring in many families. Just as the onset of the disease is rapid, with an early high temperature, which drops by crisis, so also is the character of daily incidence in separate organizations and families—massive group transmission.

PIG POINT

(Chart V—Table E)

This post consists of a garrison of 486 officers and men and 1,000 civilian employees. The reservation is not only isolated, but it was under quarantine during the epidemic. Barracks are used for civilians and soldiers alike. In spite of the fact that there was considerable overcrowding in the civilian barracks, this group had comparatively few cases. The fire and guard organizations, in which no overcrowding existed, suffered heavily. In our investigation we have been unable to attribute the explosiveness of the epidemic to overcrowding. The outstanding difference between the organizations with a high rate and those with a low rate lies in the method of messing.

The ordnance organization and civilians, constituting 1,150 persons, are messed from tableware. The rate for the eighteen-day period was 82 per 1,000, with an average daily incidence of 4.5 per 1,000, a continuously low daily incidence characteristic of indirect contact by a combination of the major and minor means of spread. The contamination of tableware by the person eating from it is probably a small factor in the spread, but the use of contaminated

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CHART V.

INFLUENZA
PIG POINT

COLLECTIVE WASHING OF MESS UTENSILS

DAILY INCIDENCE PER M-4.5
RATE PER M-82.6

INDIVIDUAL WASHING OF MESS UTENSILS

DAILY INCIDENCE PER M-21.3
RATE PER M-384.

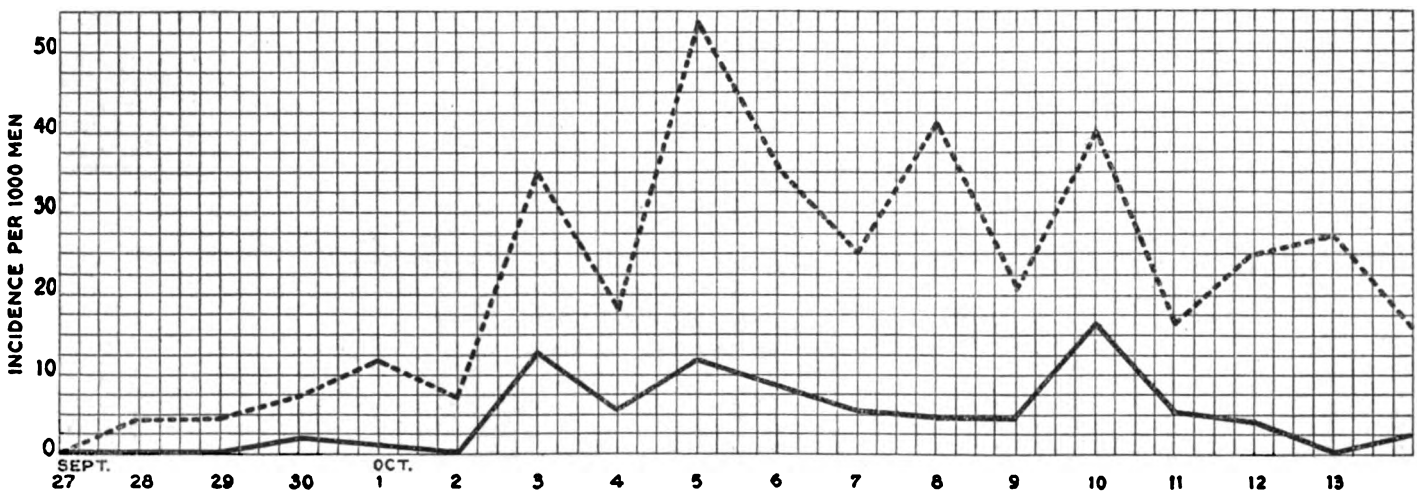

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TABLE E.—*Pig Point Ordnance Dept.*

Troops Using Tableware or Mess-kits Which Are Boiled

Organization	Strength	Sept. 27	Sept. 28	Sept. 29	Sept. 30	Oct. 1	Oct. 2	Oct. 3	Oct. 4	Oct. 5	Oct. 6	Oct. 7	Oct. 8	Oct. 9	Oct. 10	Oct. 11	Oct. 12	Oct. 13	Oct. 14	Total
Ordnance Dept.	106	.....	.....	.....	.....	.....	.....	1	.....	2	.....	.....	1	.....	1	2	.....	.....	.....	7
Q. M. C. Reel.	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Q. M. C. Chauff.	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	1
Hosp. Corps.	21	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	1	.....	1	.....	.....	3
Mal. Drainage	9	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	2
Civilian	1,000	.....	.....	.....	2	1	.....	13	6	11	10	6	4	5	16	4	2	.....	2	82
Total	1,150	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	95

Mess Kits Washed by Usual Line Method

315th F. & G.	231	.....	2	.....	1	2	2	5	3	7	3	5	13	5	15	4	9	12	7	95
316th F. & G.	214	.....	.....	2	2	3	1	10	5	17	13	6	5	4	3	3	2	.....	.....	76
Total	445	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	171
Grand total	1,595	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	266

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hands of one infected, both in the washing of dishes and handling of food, is a factor we must not overlook.

The two fire and guard organizations, whose strength was 445, ate from mess-kits washed by the old line method. The rise in daily incidence during the first six days was gradual, and immediately following this the daily incidence began to peak in both organizations, giving rise to the plateau of the epidemic, the explosive incidence of which cannot be accounted for by direct contact, but rather by massive transmission through a vehicle common to all, the hand and the mess-kit wash water. We must not overlook the fact that with the increased incidence due to indirect contact there will be increased spread by other routes. This is, of course, due to the increased contamination of intermediate conveyors other than wash water.

CAMP ALEXANDER—STEVEDORES

(Chart VI—Table F)

This chart shows the daily incidence among 7,450 colored stevedore and labor organizations.

They were all quartered in the same camp and under tentage; moreover, there were but five men in each tent. The air space, the food and water, the clothing, the weather conditions, and the daily routine in all organizations were the same with one apparently minor exception—the method of providing mess-kit wash water. In the one group of organizations the container was filled from the hot water boiler and placed out of doors, while in the other group the container with its contents was placed over fire. These two groups are unique in contrast to the others considered in this report in that *both* used mess-kits. The one group of kits are washed in warm water, the other in water over fire, kept continuously at or near the boiling point.

There is another point of difference between these two groups. The one is composed of physically fit men awaiting embarkation, the other of rejected men physically unfit by reason of a long list of chronic infections and physical disabilities, which we would expect to lower their resistance and make them more susceptible to influenza, which was widespread in the camp. Despite the assumption that there is lowered resistance in this group of men by reason of chronic infections, they suffered but a slight incursion of this disease, even though it was widespread in the camp. If, as we have hitherto supposed, lowered resistance is a marked predisposing

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CHART VI

INFLUENZA
CAMP ALEXANDER

MESS KITS WASHED IN BOILING WATER

DAILY INCIDENCE PER M-.5
RATE - PER M-9.6

MESS KITS WASHED BY OLD LINE METHOD

DAILY INCIDENCE PER M-61
RATE - PER M-110.3

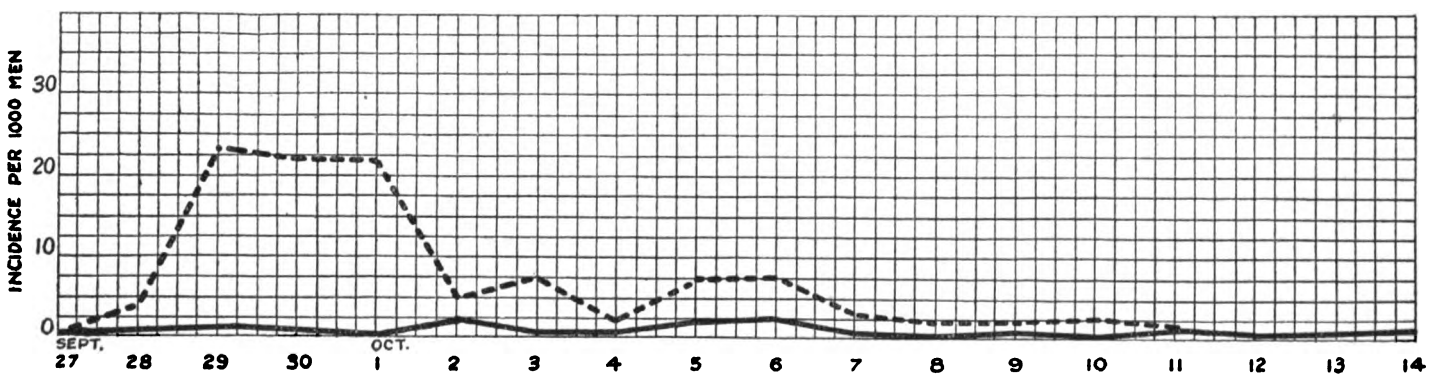

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TABLE F.—*Camp Alexander—Negro Stevedores*

Mess-kit Wash Water Over Fire

Organisation	Strength	Sept. 27	Sept. 28	Sept. 29	Sept. 30	Oct. 1	Oct. 2	Oct. 3	Oct. 4	Oct. 5	Oct. 6	Oct. 7	Oct. 8	Oct. 9	Oct. 10	Oct. 11	Oct. 12	Oct. 13	Oct. 14	Total
304th	4,050	.....	1	3	.....	.....	4	.....	.....	2	2	.....	.....	.....	.....	.....	.....	.....	.....	12
404th		.....	.....	.....	.....	.....	.....	1	1	.....	2	2	.....	.....	.....	1	1	2	1	11
405th		.....	.....	.....	.....	.....	.....	.....	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	2
429th		.....	.....	.....	.....	.....	.....	.....	.....	4	2	.....	.....	.....	.....	.....	.....	.....	2	8
430th		.....	.....	.....	1	.....	4	.....	.....	1	3	.....	1	3	.....	3	.....	.....	.....	16
Total		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	49

Mess-kit Wash Water Not Over Fire

328th	3,400	.....	8	76	68	64	5	7	.....	8	11	8	.....	5	4	.....	.....	.....	.....	264
343rd		.....	1	3	4	9	12	15	6	14	9	.....	.....	.....	2	.....	.....	.....	.....	75
701st		.....	3	.....	1	.....	.....	3	1	1	5	2	6		2	3	4	1	1	36
Total	7,450	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	375

Grand total cases 424

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factor, this group should present the higher incidence. The outstanding fact is, however, that they did not suffer from the disease in epidemic form because the avenue of transmission was broken by the boiling water in which the mess-kits were washed. In this, as in other diseases, the reception of the infection is necessary to the production of the disease.

LANGLEY FIELD

(Chart VII—Table G)

The 28th, 29th, 30th, 31st and 32nd Labor Companies were located in the same camp at Langley Field. They were composed entirely of colored troops and, with a single important exception, had exactly the same sanitary environment in all particulars. The 32nd Company used tableware which was washed in very hot water drawn from a tank connected with the kitchen range. The other companies used mess-kits which were washed by the old-line method.

It will be noted that the rates for the period of the epidemic is 80 per cent greater in that group where individual washing of eating utensils was practised; furthermore, that in this group the epidemic occurred in two explosive outbreaks,—separated by the two-day interval of incubation—while on the other hand the daily incidence was low in that group in which collective washing of eating utensils was practised.

CONSOLIDATION OF FOREGOING CHARTS

(Chart VIII—Table H)

This chart is a consolidation of all groups previously considered. The negro stevedore camp will be taken up separately. The combined strength of all units is 22,084. Tableware, or mess-kits boiled in the kitchen, are used by 9,778 of these. There were 412 cases in this group, giving an incidence for the period of 41.1. Mess-kits, which are washed by the old line method, were provided for 12,306 men. There were 2,543 cases in this group, giving an incidence of 207.1. As shown by the chart the epidemic reached its height among troops washing their own kits on October 6, and despite the consolidation of the data for all these troops the peak on this date indicates widespread infection, explosive in character. On the other hand it is to be noted that the daily incidence among troops using tableware, or boiled mess-kits, is continuously low. The average daily incidence for the one group is 14.8, while for the other, in which boiling water broke the chain of transmission, the incidence was only 2.9, a reduction of more than 80 per cent.

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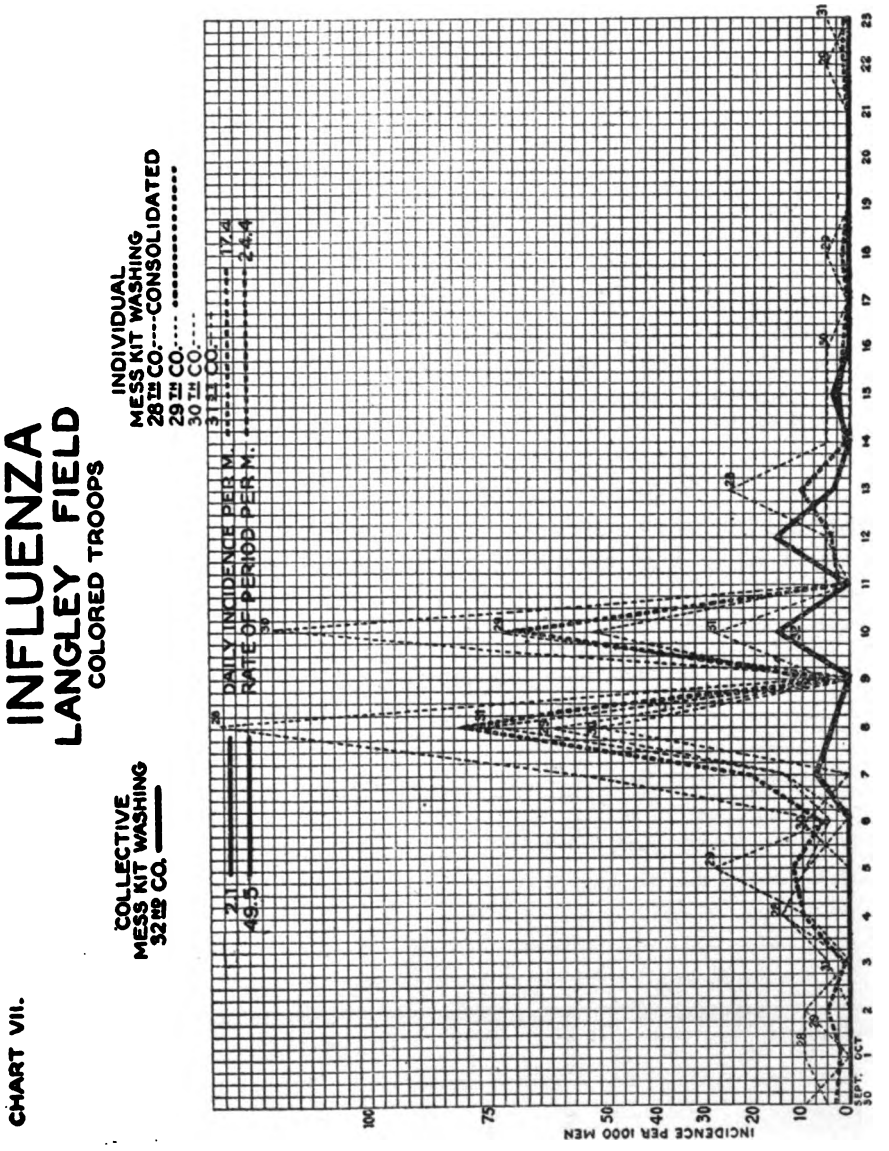

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TABLE G.—*Langley Field*

Troops Using Table Ware Which Are Boiled

Organization	Strength	Oct. 1	Oct. 2	Oct. 3	Oct. 4	Oct. 5	Oct. 6	Oct. 7	Oct. 8	Oct. 9	Oct. 10	Oct. 11	Oct. 12	Oct. 13	Oct. 14	Oct. 15	Oct. 16	Oct. 17	Total
32nd Company..	257	.....	.....	.....	.....	.....	.....	2	1	.....	4	.....	4	1	.....	1	.....	.....	13
Total.....	257	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	13

Mess-kits Washed by Old-Line Method

28th Company...	205	2	2	.....	3	2	1	12	27	2	11	.....	1	5	1	1	.....	.....	70
29th Company...	206	.....	2	.....	2	6	2	3	13	.....	15	1	1	1	.....	.....	.....	.....	46
30th Company...	206	.....	.....	.....	.....	.....	2	.....	11	.....	25	.....	1	1	.....	1	1	.....	42
31st Company...	206	.....	.....	1	3	2	.....	3	15	1	6	.....	3	2	.....	.....	1	.....	37
Total.....	823	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	195
Grand total...	1,080	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	208

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CHART VIII.

INFLUENZA
CONSOLIDATED UNITS

COLLECTIVE MESS KIT WASHING STRENGTH	CASES	ORGANIZATIONS	INDIVIDUAL MESS KIT WASHING STRENGTH	CASES
689	65	DEPOT Q.M.C	401	191
1630	76	ATT. SURGEON'S	700	87
1785	82	CAMP HILL	3654	304
217	32	MORRISON	2943	1220
1150	95	PIG POINT	445	171
4050	39	ALEXANDER	40	375
257	18	LANGLEY FIELD	823	201
9778	402	TOTALS	12306	2549
2.9		DAILY INCIDENCE PER M.	14.8	
41.1		RATE FOR PERIOD PER M.	207.1	

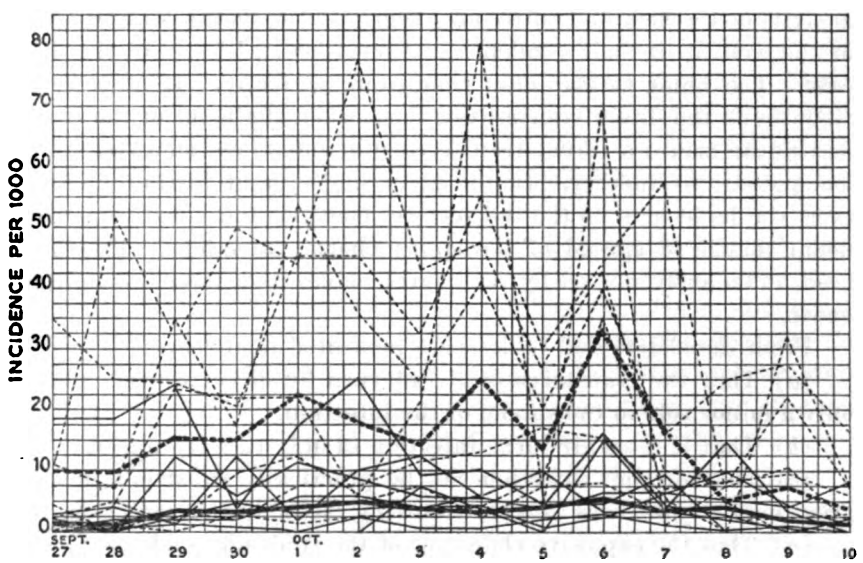

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TABLE H.—*Consolidated Tabulation*

Tableware

Organisations	Strength	Cases
Q. M. C. Depot	689	65
Attending Surg. Unit	1,630	76
Camp Hill	1,785	82
Camp Morrison	217	32
Pig Point Ord. Dept.	1,150	95
Langley Field	257	13
Camp Alexander[1]	4,050	49
Total	9,778	412

Mess-kits

Organisations	Strength	Cases
Q. M. C. Depot	401	191
Attending Surg. Unit	700	87
Camp Hill	4,015	304
Camp Morrison	2,943	1,220
Pig Point Ord. Dept.	445	171
Langley Field	823	195
Camp Alexander[2]	3,400	575
Total	12,727	2,543

Grand total strength.....22,505 Grand total cases.....2,955

ROUTES OF INFECTION

It is the consensus of opinion that in infected persons the influenza virus is resident in the discharges from the mouth and nose. Hence it is logical to conclude that the portal of exit is by the same orifices. It is also universally conceded that they also act as the portals of entry not only for the influenza virus and its secondary invaders, but of many other pathogens as well. Therefore, any agency which will remove infected secretions from the mouth and nostrils of the sick and introduce them into the mouth and nostrils of the well, with their virulence undiminished, will spread the disease. The hand fulfils these conditions perfectly. It acts occasionally as the direct transmitter, *e. g.*, when the hand of the careless nurse makes a direct transference of infectious material from one patient to another. In the great majority of instances, however, the hand acts as the indirect transmitter and constitutes the usual vehicle of spread of the sputum-borne infections. This has been abundantly proved by the charts, tables and other data given above.

From the charts and tables here presented it appears:

(*a*) That the transmission of influenza by direct contact plays only a minor rôle in the spread of the infection.

(*b*) That it is an air-borne infection in only rare instances.

(*c*) That droplet infection can be practically ruled out in the great majority of cases as a transmitting factor in this infection.

(*d*) That the explosive character of the epidemic, such as shown in those organizations using mess-kits, cannot be accounted for by direct contact infection.

(*e*) That there is a major and also a minor route of transmission by indirect contact—the former through faulty methods of

[1] Use wash water over fire. [2] Use wash water not over fire.

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messing, the latter through inanimate conveyors. Direct routes are subsidiary to indirect transmission.

(*f*) That the old line method of washing mess-kits by each individual man in tepid water used by the entire company is largely responsible for the spread of the so-called acute respiratory diseases.

(*g*) That transmission by direct contact *per se* even in overcrowded quarters is not a large factor in spread, but that spread by indirect contact in crowded quarters is in proportion to the degree of contamination of inanimate objects with fresh infectious material which may be readily taken up by the hands.

(*h*) That the explosive character of the epidemic in those organizations using mess-kits is many times greater than in the civil population.

(*i*) That the low daily incidence in those organizations using tableware, or having their mess-kits boiled by the kitchen force after each meal, would appear to be higher than the rate in civil life.

DISCUSSION OF POINTS

(*a*), (*b*) *and* (*c*).—Direct contact, or air-borne infections as usually interpreted, are spread by kissing or by inspiring the infective agents expelled by the acts of coughing or sneezing—droplet infection. We believe that the virus is transmitted by either of these routes to a very limited extent. The pneumonia hemolytic streptococcus complication following measles is usually considered a hospital contact or air-borne infection, but as shown by our report over 80 per cent of all these complications occurred in patients who were carriers of the streptococcus upon entering the hospital. The cubicle system of isolation was carried out in all measles wards, and it may be pointed out that although this method of isolation was for the purpose of protecting patients from cross infection, yet we were unable to demonstrate any appreciable increase in the rate of streptococcus carriers among the ward surgeons, enlisted men, and nurses, who were continually exposed by direct contact.

From this prevalence of streptococcus carriers among measles patients as contrasted to the prevalence in civil population, we were led to believe that there was some major route of spread by indirect contact common to army life. It would seem, if the old line method of washing mess-kits is responsible for the higher explosive epidemics of influenza in certain organizations, that this would also hold true for the spread of the virus of measles as well as the streptococcus.

(*d*) *and* (*e*).—It would seem quite impossible for an explosive

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epidemic such as occurs among organizations washing their own mess-kits to be accounted for by direct contact infection. The possibility of spread by direct contact or by air to the extent shown in Chart I (over 100 per 1,000)—and this without any appreciable number of primary cases—is very remote. The virus is highly communicable, but not to such a degree by direct contact. The incidence on a single day can, however, be readily explained by the indirect contact or major route through mess-kit wash water contamination. There are probably carriers of the influenza virus, and there certainly are unrecognized mild cases. In a given organization these individuals contaminate their mess-kits and their hands. The virus is then transferred to the mess-kit wash water, not only by the mess-kit, but to a far greater degree by the hands. This is repeated three times a day so long as there are carriers of the virus. Low temperature fails to destroy the virus, and as a result all those who wash their kits in the contaminated water are exposed not a single time, but three times a day over a period of perhaps several days. These exposed men contaminate not only their mess-kits, but also their hands. Their hands are likely to introduce the infection into the nose or the mouth (soldiers do not wash their hands frequently); in addition food eaten from the contaminated mess-kit may introduce the infection. This double exposure, hand-to-mouth and mess-kit to mouth, by indirect contact indicates the possibility of mass or repeated inoculation, not during a single meal or day, but over a period of several days. Furthermore, the repeated inoculations consist not only of the virus of influenza, which is non-fatal, but in addition to this those organisms, pneumococcus and hemolytic streptococcus and viridans, which are fatal secondary invaders. It would seem to us that this is the major route of spread of the acute infections. We have been suspicious of the mess-kit wash water since our investigation of the measles epidemic in the Southern Department last winter, and perhaps our theory of transmission by this means explains the much higher rate, not only of measles but also of fatal streptococcus post-measles pneumonias among troops, over that found in the civil population.

If this indirect contact route is the major method of spread, it is quite reasonable to assume that the indirect minor route follows the same general mode of spread. This we may designate the touch route, viz., mouth or nose of the infected to hand, hand to inanimate object, inanimate object to hand of non-immune, hand of non-immune to mouth or nose—result infection. This route may, of course, be

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shortened by transfer from hand of infected to hand of non-immune. The bad habit of smothering the cough with the hand adds greatly to the possibility of hand to hand transfer. We are all familiar with inanimate objects, which are touched or handled by large numbers of individuals. These may be regarded as intermediate conveyors. If a recently contaminated hand of an infected individual soils a door-knob, a pencil, a street car hanger, a telephone receiver, or many other conveyors which might be mentioned, it is a certainty that non-immune individuals may become infected from the conveyors through hand-to-mouth infection. We do not know what percentage of transmission is by this route, but procedures in certain organizations have been instituted which may shed some light on this point.

It is reported that among the forces in the Spanish American War typhoid was prevalent because of lack of sanitary toilet facilities. This condition resulted in extensive contamination of camps and surroundings by intestinal excretion; this in turn gave rise to many infections by the indirect contact route. This situation has been corrected by instituting sanitary measures for the disposal of human waste. If typhoid is thus produced through insanitary toilet facilities and by the indirect route of the intestinal excretions to the mouth, it is only logical to conclude that the so-called respiratory diseases may be transmitted through insanitary washing of mess-kits, and by the indirect contact route of mouth-to-mouth infection.

If the method of washing mess-kits in the army is responsible for the high rate of infections, we must not overlook the method of washing tableware in civil life as a possible means of spread. If this is the major method among troops, it is probable that dish washing among troops with tableware, as well as in civil life, accounts for a large part of the transmission in such organizations and families after the infection has once been introduced.

(*f*).—Observation of the washing of mess-kits by forces in the field has the appearance of an insanitary procedure. The amount of water provided is wholly inadequate, its temperature, especially during the winter months, is far too low to have the desired sterilizing effect. There are usually many suspended food remnants, giving the appearance of dirty water. The amount of water used by each company of 250 men varies from 8 to 30 gallons. The temperature in the winter months will vary between 25°C. and 90°C., the average being about 47°C. The water is usually placed out of doors by the

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kitchen force prior to serving the mess. If the containers are not placed over fires, the contents cool very rapidly in the winter months during the first ten minutes, while the men are eating, to a comparatively low temperature. Considerable time is required for all the men to wash their kits, and unless there is a fire under the containers the water is hardly warm when the last man uses it. In the summer months the fall in temperature is not so rapid and the sterilizing action even in the case of dirty water is more effective. During this period the bacterial counts of samples of mess-kit wash water varies between 2,000 to 12,000 per c.c., while in the winter samples have been found to contain as high as 157,000 per c.c. Colon bacillus is frequently found in these samples (special report to be transmitted).

Under these conditions of washing mess-kits it would seem apparent that the possibility of transmitting mouth-to-mouth borne infections—acute respiratory diseases—is many times greater than by direct contact.

(*g*).—Assuming that the theory of spread by indirect contact is correct, and we know of no definite information to the contrary, it would seem that the major routes of transmission in crowded civil and army life would in the main follow this same general method. We have presented figures which seem to show that it is chiefly transmitted through mess-kit wash water. This is indirect contact and has its parallel in saliva pollution of those inanimate objects (door knobs, backs of chairs, pens, toilet articles) which come in contact with the human hand. The street car hand-rail is grasped by thousands each day, as is also the door knob of the public building, and the non-immune is exposed to infection in proportion to the degree of saliva pollution of these objects by carriers, unrecognized mild cases and convalescents. The number of secondary cases resulting from these contaminated inanimate conveyors will largely depend, not only on the number of carriers and crowded conditions, but also on the general personal cleanliness of the community. We are led to believe that spread through these intermediate conveyors is the minor route of infection by indirect contact, while the major route is through the method of washing mess-kits.

(*h*).—From press reports, and this is our only source of information at this time, it appears that in the civil population the rate for the ten days preceding the peak of the epidemic is approximately 8 per 1,000, which corresponds to the rate in military organizations provided with tableware. The highest rate in New York for any

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single day was 1 per 1,000, in Boston slightly over 1 per 1,000. In Newport News on the other hand we find this rate to be 5 per 1,000 on the ninth day of the epidemic, and assuming that our theory of indirect transmission through saliva pollution is correct, we have a ready explanation of this high rate by reason of the filthy, insanitary condition of the town. Records from different cities will doubtless show that the rate of infection of this disease is what might be termed the index of the individual and civic cleanliness of the community. The total rate for the ten days prior to the peak of the epidemic in Newport News was 12 per 1,000 population (an attempt is being made to procure statistics from several cities).

If the daily incidence of infection is less than 1 per 1,000 for the civil population, there must be some extraordinary situation, aside from overcrowding, to account not only for the very much higher rate but also for the explosive incidence among troops. The epidemic of influenza has a comparatively long duration in a city (one month or more); its peak is reached at a comparatively late date, while in army organizations the epidemic is short, explosive, and peaks at an early date. The incidence of the infection among troops using tableware is, for the fourteen-day period, 59 per 1,000, while among those using mess-kits it is 255 per 1,000. The latter group has 77 per cent more cases than the former. The daily routine and the quartering of the two groups is not dissimilar, and the method of messing is, so far as we can determine, the only outstanding feature which could account for the difference in rates.

TRANSMISSION DURING VOYAGE

The naval ships are well equipped for the washing of mess-kits, but it has been found that troops do not always take full advantage of the steam-heated water which is available. This is because of the fact that the medical officers accompanying troops overseas are not familiar with the working of the equipment, and the individual soldier is left more or less to his own judgment in this matter.

The commercial liners which were pressed into the service were not adapted to the carrying of troops. The remodeling of these ships, as troop carriers, was difficult, and it is found that facilities for washing mess-kits are inadequate.

On any ship, however, a medical officer with the average amount of ingenuity can devise methods of sanitary messing and provide boiling water for mess-kit washing.

The washing of mess-kits on board all transports should be supervised by a competent officer.

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PREDICTION

Since mess-kits are generally washed by the old-time method, and inasmuch as the rate in our report is approximately 255 per 1,000 and covers only that period which represents the height of the epidemic plateau, it may be predicted that among our forces, we will say, 500,000 now stationed in the United States, *at least* 125,000 men will be stricken with the disease. At least 12 per cent, or 15,000, of this number will develop pneumonia as a secondary infection. During this season of the year, at least 25 per cent, or 3,750, of the secondary pneumonia cases will terminate fatally. Approximately 3,000 of these fatal cases received, not only the virus infection, which is non-fatal, but also the infecting agents of the fatal complication, through the present insanitary method of washing mess-kits.

The soldier is *continually* exposed to infection with the secondary invaders. This is but rarely the primary cause of disease. He becomes a carrier, and at a later date he receives the virus infection which paves the way for any one of the three secondary invaders. We believe the pneumonia rate among troops will prove to be many times greater than among the civil populations; furthermore, that this rate, as well as the influenza rate, will be higher among civilian males than females and children.

It may be added that, in addition to the saving of lives, the adoption of this preventive sanitary measure of messing—boiling of mess-kits—will, on the basis of 500,000 troops, prevent approximately 75 per cent or 93,750 cases among this number of troops.

Additional preventive measures for the minor group of transmitting routes, such as those depending on individual habits, will be taken up at another time.

PREVENTIVE MEASURES

1. The maintenance of mess-kit wash water at the boiling point by placing the container over fire. The accompanying plan provides a convenient fire box on which three G. I. cans are placed.

2. The elimination of the common towel used for drying mess-kits.

The plan mentioned under paragraph 1 is not to be wholly depended upon, but we have found that a thoroughly good working scheme is to turn in the mess-kits to the kitchen where they are passed through G. I. cans of boiling water, the first one containing soap. In order that this work may be made simple and easy, it is a good plan to resort to the use of wire baskets which will fit into the

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G. I. cans. With these baskets as a holder, the kits may be readily transferred through the several washings. The mess sergeant should, of course, be held accountable for the men's equipment which is checked in and out at each meal as in the cafeteria system. By adding one or two men to the kitchen force, this plan can be readily accomplished.

4. When tableware is used it should be scalded after each meal, and the kitchen force should be prohibited from cooling this by the addition of tap water.

5. The use of paper towels as a means of cleaning mess-kits has been resorted to in a number of organizations at this port. In regard to cleanliness fair results are obtained.

The method has its advantages in preventing cross infection under field conditions when good washing facilities are not obtainable.

6. The use of boiling water for mess-kit washing on all troop ships.

7. Tableware should be supplied in all organizations permanently located.

8. The many other details of prevention, as frequent washing of hands with soap, keeping hands away from the face, etc., will not be taken up at this time.

CONCLUSIONS

1. Influenza, as well as the other so-called air-borne or respiratory diseases, is essentially a hand-to-mouth infection.

2. There are major and minor modes of transmission by indirect contact—by the former through tepid mess-kit wash water, and by the latter through intermediate inanimate objects, the hand being the conveyor in both instances. Among troops approximately 75 per cent of the cases arise by the major route. This applies to troop transports as well as camps.

3. Transmission by direct contact is only subsidiary to the indirect routes.

4. The adoption of a universal method of washing mess-kits in boiling water will enormously reduce the prevalence of all mouth borne infections.

5. The prevention of the hand-to-mouth infections may be accomplished by any measure which will prevent the unclean hand from visiting the mouth and nose and by the thorough cleansing of the hand after all such visits.

6. The incubation period of influenza would appear to be from two to three days.

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7. An epidemic of influenza among troops may be controlled by elimination of hand contaminated dish water.

ACKNOWLEDGMENT

Indebtedness for assistance is acknowleged to many medical officers at this port. Without this assistance, it would have been impossible to carry out the studies on which this paper is based; all those who were called upon to help have done their utmost, and it is difficult to pick particular medical officers to whom special acknowledgment should be expressed. Surgeon W. C. Rucker, U. S. Public Health Service, has been cognizant of the work since its inception, and his criticisms and assistance in collecting data certainly merit special acknowledgment. Lieut. A. D. Hiller, Sanitary Corps, displayed great interest and labored early and late to prepare the charts. They speak for themselves as to the success of his endeavors in this direction.

The following has been brought to the attention of the Editor: In Comment and Criticism, page 698, second paragraph, Volume XLII, the following statement is made:

"At the close of hostilities he would have the situation wholly in hand; he could remain if he chose, with the advantage of promotion that had come to him during his service, or he could resign and go into private practice, equally with the temporary officers who will be mustered out and who, should they wish to remain permanently, could do so only after long delay, a searching examination and loss of rank."

It is evident that this is not strictly correct, for those who are commissioned in the regular service are required to make signed statement of their intention to remain in the service for not less than five years after being commissioned.

The statement viewed from a strictly technical standpoint is correct inasmuch as anyone has always the inalienable right to resign any position, but it is manifestly in error as a general proposition since in this case the resignation would not be accepted except under most exceptional circumstances. This notation is made here in view of the fact that several inquiries have been addressed to the journal in regard to this matter.

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A SUMMARY OF THE ACTIVITIES OF THE SECTION OF OTOLARYNGOLOGY[1]

By Lieut. Colonel HARRIS P. MOSHER

Medical Corps, United States Army

I APPRECIATE very much the honor of being asked to speak before this meeting of the Association of Military Surgeons. My work since coming into the Army has been largely administrative, and I feel a little bashful about choosing a clinical subject or one that is purely academic. I have looked over my fragmentary war experience which began three years ago as a member of the first Harvard Unit serving with the Royal Army Medical Corps of the British at Camiers, France, and was continued last winter by an observation trip of two and one-half months in the interest of the specialty which I represent. The trip occurred last fall and carried me through northern and western France and ended in England. I made two inspection trips to the cantonments which border our eastern coast, one trip north when the cantonments were just started, and one south about two months ago, finishing at Camp Beauregard. The rest of the time I have been at my desk in the Surgeon General's Office engaged mainly in procuring and assigning personnel. As a recruiting officer for my specialty I have seen much of the seamy side of human nature. Fortunately I have seen also the other side. In assembling material for this paper I have studied the monthly reports sent in by the Section of Surgery of the Head from the various cantonments and I took certain facts from them which I hope will be of interest. The paper in part, therefore, will have a clinical bearing. It will deal also with a few administrative subjects, with the observation trip abroad, the present organization of the Section of Surgery of the Head overseas, and it will close with a paragraph or two of what might be called reflections. I am like Colonel de Schweinitz in one respect—there have been ministers in my family. I confess to a tendency at times to exhort and perhaps to preach. However, I will make the preaching as short as I can.

[1] Read at the Annual Meeting of the Association of Military Surgeons, held at Camp Greenleaf, Fort Oglethorpe, Georgia, October 14, 15, 16, 1918.

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CLINICAL OBSERVATIONS

The greater part of the work done by the otolaryngologists has been good, although frankness compels me to state that some of it has been questionable, if not poor. Men of large hospital experience, who could face an epidemic of any kind calmly and not be swept into a furore of operating, were not in the service in sufficient numbers to steady the otolaryngological service at every base hospital. Therefore there have been rumors of over-operating at some places. At other base hospitals the operative technique does not appear to have been quite up to the standard. For instance, in one series of 158 mastoid operations there were 28 reoperations and 8 cases of facial paralysis, 6 of which proved permanent. I am disposed to be very charitable to the men who in the early days worked with scanty equipment, with untrained assistants and poor facilities generally, but after making all allowances the record just quoted is not an enviable one. It is the glory of the military surgeon to work, if necessary, with scant and minimum equipment. A strong man delights in it just as he delights to rough it in the woods. I admire the man who has the courage to operate when he believes that it is necessary, and I can readily forgive some of the younger men who, with no older head to steady them, met the emergency of mastoid epidemics which occurred here and there in the base hospitals of this country last winter by what may seem on close inspection to savor of over-operating. The sum and substance of what I am trying to say is this, that so far not enough of the older hospital men have come into the service to go round. On the whole the work has been good; that it has fallen down in certain places is due to the fact that the men who have the training to make it better thought fit for various reasons to stay out of the service, but the new draft—those who have to do with the recruiting of medical personnel are grateful beyond words for the draft—will change all this.

The monthly reports show that during the past winter and spring the streptococcus had a field day at certain cantonments. In reporting a series of cases of mastoiditis which were operated at Shelby the medical officers maintained that mastoiditis was epidemic there and made out a very good case in favor of this opinion. Mastoiditis following measles often took a fulminating course and was characterized by early painless and severe destruction of the cellular structure of the mastoid process. The relative rarity of

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sinus thrombosis with the mastoid cases has been striking. More than one observer has felt that the involvement of the mastoid was often a part of general blood stream infection.

There has been another type of mastoid case which is out of the ordinary. This has occurred a few times: A patient would be operated for an ordinary acute mastoid and recover without complications, the wound healing early and thoroughly. Then after a period of four to six weeks, when the patient was apparently well, symptoms of meningitis would set in and the case would go on to a rapidly fatal termination. At autopsy the mastoid wound would be found to be thoroughly healed and no trace of the course of the infection from the mastoid to meninges could be discovered. I have never met such a case in civil practice. Major Day, of Pittsburgh, I feel has suggested the best explanation. It is his opinion that in these instances there was at the start a circumscribed meningitis caused by a blood stream or a lymphatic infection from the middle ear or from the mastoid. The involvement of the middle ear and of the mastoid cleared up, but the meningitis slumbered, later to break its bounds and become general. Such cases should put us on our guard about giving the usual favorable prognosis in acute mastoiditis.

In the practice of otolaryngology at the base hospitals diseases of the tonsils rank next in importance to the cases of mastoiditis. The tonsils are often the seat of the initial infection which later leads to infection of the respiratory tract. Chronic infection of the tonsils, of course, is one of the causes of infection of the heart or of the joints. Further, the tonsils are chronic carriers of bacteria, especially of the streptococcus. The indictment against the tonsils, then, is a long one. Not so many charges are made against the adenoid, but there is one which is very serious—it has been found that the meningococcus lives preferably in the vault of the pharynx and in the crypts of adenoid tissue. Experience has shown that the most efficient way of clearing up a chronic carrier of streptococci is to remove the patient's tonsils, and the same is true of the soldier whose tonsils continually harbor diphtheria bacilli. It is easy, therefore, to see why the removal of tonsils and adenoids is one of the stock operations of the otolaryngologist. The number of enucleations per month varies in the base hospitals from 25 to 350. The latter number is the return from Camp Lee for August, where there was a campaign of enucleation. A normal nose and a normal throat are the greatest protection that a soldier can have,

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with the possible exception of the protection afforded by the anti-typhoid and antitetanus inoculations. I have tried not to be a faddist in this matter, but my convictions are strong. I maintain that in our standing army, which is to help maintain peace when it comes, it should be required of every recruit that his nose and throat be normal or made so before he takes his place in the ranks. Having on two occasions in this war had experience with the climate of France, and knowing the prevalence of tonsillitis and respiratory infections among our troops there, I am not easily frightened by the charge of over-operating.

Tonsillectomy has been performed in most instances under local anesthesia produced by the injection of cocaine or novocaine. Recently procaine has been ordered where obtainable. I was especially interested in the technique of tonsillectomy, because, being more or less isolated in New England, I have always favored ether anesthesia, wishing to take my time at the operation and to have the patient unconscious in case it became necessary to deal with hemorrhage. Adult tonsillectomies have always been supposed to furnish more cases of post-operative hemorrhage, and with the large numbers of operations which have been done in the cantonments I have been expecting to hear of some deaths from this cause. As yet none have been reported, and of course I hope none will be, but we shall be very fortunate if some do not occur before the end of the war. In the beginning, some ether operators switched to local anesthesia owing to the lack of capable assistants and equipment, and they became converted to the procedure. The west and the south have long favored local anesthesia for the removal of tonsils. I have discovered that we are all to learn something from each other in this war, and I feel that I for one may have to revise my technique more than once. Two deaths have occurred presumably from cocaine intoxication. Such happenings in my judgment are unavoidable and are bound to occur again. There has been one death from embolism under ether during tonsillectomy.

The number of cases of peritonsillar abscess during the winter and spring has been startling, as many as fifty being reported for a month by Camp Devens. Generally the monthly reports record five or six cases of acute sinusitis, mostly infections of the maxillary antrum. One base hospital reported fifteen operations upon the sphenoid. In peace times the winter months give the greatest number of mastoid infections and the majority of these occur in the north, mastoid operations being comparatively uncommon in the

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south. Last winter, however, some of the southern camps had as many cases as those in the north.

The number of beds in use for the ear, nose and throat cases at the usual 2,000-bed hospital varies from 35 to 200. It is not uncommon to have a daily out-patient clinic of 75 patients in busy times. At such times also the treatments average over 2,000 a month and the operations 200 or more. The department of otolaryngology certainly earns its keep.

INSTRUMENTS AND SUPPLIES

Most of the base hospitals are well supplied, although a few are still awaiting their complete equipment. Even after a year the instrument makers are not always able to furnish promptly what the Government orders. The hospitals abroad need instruments badly. Practically none of the medical publications which have been sent during the past year to the hospitals overseas have yet reached them.

BUILDINGS

Two types of building have been in use by the Section of Surgery of the Head. The first was too large; the second, used in the National Guard cantonments, proved too small. The Section of Ophthalmology has done very little operating, and their operating rooms in the larger building stood vacant until the hard-pressed commanding officers could not resist the temptation to take them for other purposes. In the two-storied hospital buildings of the future a new plan has been worked out in conjunction with the Department of Construction, and all waste space has been eliminated. This plan is designed for a 2,000-bed hospital. Another has been made for a 1,000-bed hospital and one for a small post hospital of 150 beds. In the future, therefore, a fitting nose, throat, ear and eye department is available for a hospital of any size.

Colonel Parker and I have found it most fascinating to work over these plans. We had a free hand and could carry out ideas which we long had in mind. Colonel Parker is a natural architect and has a horror of waste space, and as my superior, has seldom failed to alter my suggestions. Unfortunately he did not help on the first building of all. Not only in working at such problems as these buildings present, but also in dealing with instruments and supplies generally, are you thrilled at the amounts and the figures involved—figures which stagger even a calculating machine. Often, of course, you are both thrilled and appalled. Then, again, a sense

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of power seems to radiate from the tasks, and you feel as if you held Aladdin's lamp.

I have been interested in what might be called the normal number of men needed for the otolaryngological staff of a 2,000-bed hospital. Nothing is stable in the Army but, as far as I can work it out, the figures are as follows: Besides the chief of the section there should be two men for ward surgeons, and two medical officers to assist in the clinic. A trained anesthetist should be at the disposal of the section at any time. If the section is to supply otolaryngologists for the examination of the draft men, there should be three more men who would be available for assignment to this service for stated periods. Few of the good men like this work, but it is highly important. It requires accuracy and speed, and really the best men in the service should be assigned to it. So far this has not been the case, because there have not been enough men of this type to go around and because, when a medical officer was once in camp, a release to the base hospital was not always easy to obtain.

The reports of the examinations of the drafted men show that the majority of the cases rejected by the otolaryngologists are cases of chronic running ear. This was to be expected. The drastic regulation that all cases of running ear were to be rejected was the outcome of the experience of the Allies. Even when such cases are dry at the time of examination they readily relapse under war conditions. A soldier seeking a furlough or relief from duty at the front can almost at will bring about a discharge by filling the ear with dirty water. Cases of chronic running ear, therefore, should be taken for full military duty only under the direst stress for men. This was the reason why the English army was filled up with these cases at the beginning of the war. Even with us in our early days many such cases reached the cantonment base hospitals, due to hasty if not careless work on the part of our examiners.

There have been a few regrettable happenings in connection with our medical personnel. Two medical officers have contracted syphilis while operating. In one of these cases the action was due in part to the fact that rubber gloves were hard to obtain, and because those who had the small supply there was were not willing to share alike with their fellows.

RECORDS

If good records are kept, the statistics accumulated by the draft examinations should prove very valuable. After the war the medical

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statistician will turn to them as to a treasure house. Speaking of records, allow me to make the rather trite observation that the scientific value of this war, as far as medicine is concerned, is largely a matter of good records. One hesitates to add more paper work than is already called for in the Army, but good records are vital. The initiative in this matter rests finally with the commanding officer of the base hospitals and the chiefs of the various sections. By means of the army record a soldier patient can be traced for years to come. What better opportunity has the medical profession ever had of settling many of its problems than it has before it now? For instance, what better opportunity has there ever been of finding out the result of tonsillectomy in chronic affections of the heart or of the joints? Naturally every medical officer whose overseas examination proves him to be physically fit wishes service in France. I have been in France twice during this war and I assure you that it is a great question in my mind whether the fuller scientific opportunity, particularly in the line of preventive medicine, does not lie in this country rather than overseas.

The matter of records has lately been taken up in the Surgeon General's Office. A revision of the army record system is under way. This is one of the many—I almost said pernicious—activities of Major Bagley. He has been assisted in this work by Captain Allen.

Cape May.—General Hospital No. 11 at Cape May has been given a staff and equipment which make it practically a special hospital. It is designed to receive head cases from abroad and to act as the hospital of last resort for such cases as occur in the hospitals of this country. It is already moderately busy.

At Cape May also Lieutenant Colonel Richardson has his school for the instruction of the deaf, and for soldiers with speech defects

MALINGERING

Malingering is a new subject to the lay physicians who are now serving as medical officers in the Army, and it has all the fascination that always goes with anything irregular and new. Detection of a malingerer reduces itself in most cases to a battle of wits between the examiner and the recruit. More recruits feign defective vision than defective hearing. In detecting aural malingerers some modification of the stethoscope test has proved the most useful. The prize malingering case that has come to me is as follows: It was observed by Dr. Joseph G. Beck, of Chicago, now chief of head

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surgery with the Czecho-Slovak forces. A young Austrian presented himself before the examining board with a running ear. The ear was wiped out, but something about the odor attracted the attention of the examiner. It was offensive, but it was not just the odor so long familiar in the Out-patient Department. When the ear was wiped dry a pink granulation was seen to block the canal. Busy as he was, something impelled the examiner to syringe the canal and not reject the man without carrying the examination further. The syringing brought out the granulation. Examination then revealed a normal canal and a normal drum. The man was then confronted by the psychiatrist of the board, who has a reputation for dealing with malingerers. He showed him a large picture of the Illinois State Penitentiary and told him that he would be sent there unless he confessed. The man yielded and told his story. A relative of his was a physician, and he promised to get him rejected in the draft. Accordingly the physician placed a piece of meat in the canal of his friend's ear and filled the canal with an abundant discharge made of powdered cheese mixed with water. If there was ever a case of high talent gone wrong, this is one. You cannot help wondering how often the trick has been played successfully.

TEACHING

The sections of ophthalmology and otolaryngology have not felt that specialists could be manufactured during the war. They have, however, used various base hospitals for instructing men who already had some knowledge of their specialties and for rating these men. Sherman, Dix, and, while Major Todd was alive, Camp Dodge were so used. Now that the Officers' Training Camp at Oglethorpe has come into flower, these places will be used for teaching purposes but little, or not at all. The two specialties are proud of the men they have here at Oglethorpe and are grateful for the help and cöoperation which they have met with on all sides. It is a great pleasure to stand here and to thank the gentlemen on this platform who have been responsible for this satisfactory state of affairs. Before the teaching and rating were concentrated at Oglethorpe it was very convenient to have the teaching centers at the base hospitals mentioned above, because it was soon found that if medical officers who were specialists were sent to the various Officers' Training Camps they often did not return to the fold. They seemed to prove unusually good material for instructors. This we tried to look at as a compliment to our men but, contrary to the general opinion that has

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prevailed, there never have been more than enough specialists to go around, and had it not been for the extension of the draft ages the hospitals which are now being assembled for overseas could not be supplied with men in the specialties without crippling the base hospitals in this country.

CRITICISMS FROM WITHIN THE SERVICE

The following is an extract from a letter by one of the country's well-known otolaryngologists:

Unofficially, as friend to friend, as a junior to a chief, and as one intensely interested in the service, you may be interested to know of several details in which the service I have seen has been deficient.

One is the care given acute middle-ear cases. It would seem to me that the ideal monthly report should contain relatively many myringotomies and few mastoids. I have seen cases go on to mastoid operation which, if handled with care and attention, probably would not have done so. On the other hand, I have seen a good many ear and threatened mastoid cases which by careful attention recovered without operation. And in these days of intensive training the number of days lost by a soldier who has had his mastoid opened is a matter of some moment.

The second is the lack of asepsis as applied to tonsil, septum and sinus operations. I realize, as all do, that perfect asepsis in these lines of work is impossible, but much can be done by the operator to prevent and reduce to a minimum, complications. Some of the precautions I have seen neglected are failure to have the patient's face shaved before operation, failure to paint the fauces with iodine solution before injecting the anesthetic for a tonsillectomy, failure of the operator to wear gloves, etc. Perhaps these all are an old story, but I have been impressed with their result in causing many additional hospital days and in holding back the progress of many enlisted men.

The third is a lack of keenness on chronic sinus conditions. This is the most common fault I have run across. Most of the men seem to appreciate the possibilities of the tonsils as foci—but sinuses *not*.

The service and experience I am having is wonderful, and I only wish that I was twenty years younger so as to be able to apply the benefits of it that much longer.

The following, from another Chief of the Section of Otolaryngology, is the reverse of the shield:

For anyone with experience, I do not see much outlook for chiefs of head surgery and general surgery. They are directors and are busy chasing lost masks or bed-pans. The only outlet is to be in training for C. O., and then see what his troubles are. One can develop a wonderful clinic, but to get men overseas the major operating must be limited,

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and the real experience is military in doing only what can be done by the opportunities afforded by the war—handling men and seeing how far you can climb before you drop.

The epidemic is getting under control or limiting itself. We have stopped taking any but very sick cases. Five hundred came in three days.

The following extract from a consultant's report I do not take as seriously as the writer of it does. I consider it somewhat of a compliment to be accused of enthusiasm and of activity.

Unnecessary Operations.—Upon this subject it is difficult to be fair without an opportunity to study the cases operated, but I was told by the post surgeon and the chief of service that the throat operators visit all patients in the hospital and advise tonsillectomy very freely. They are averaging about 120 cases a month. I became interested in one history which explains the situation. This patient, an officer and a casual, taken from a troop train, was brought in with abdominal pain and a tentative diagnosis of appendicitis. There seemed to be some question about the diagnosis, and operation was not done. After a few days he was visited by the throat specialist and his tonsils were removed for possible focal infection. I asked to see the officer, who was still in bed, and feel certain that he is now convalescing from an acute appendicitis.

Eye, Ear, Nose and Throat Sections are very active and constitute the busiest department in the hospital. This department needs a good head.

COÖPERATION WITH OTHER SERVICES

The coöperation between the various medical departments of the base hospitals and the Section of Otolaryngology has been very intimate. The Department of Internal Medicine has spent most of its time combating infectious diseases. Conspicuous among these have been scarlet fever and measles, and the latter has added to its previously evil reputation in causing aural complications. America never before saw such gigantic infectious hospitals as the base hospitals at cantonments have become periodically. At the present moment we have received from neutral Spain an epidemic of influenza which has brought about a return of this condition of affairs on a scale even larger than before. The best of our otolaryngologists have looked upon their work as chiefly preventive, and have sought every opportunity to make their work along this line effective.

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Camp Sherman, one of the leaders in war ophthalmology and otolaryngology, was one of the first to grapple with the problems in a systematic way. Major Holmes established what he called his "Extra Mural Service." Major Reik worked along the same lines, and now Major Fetterolf, a recent strong man to enrich the service, puts the same ideas into execution. A recent letter from him on this subject will serve to give the ideas of all three:

The work to be done is limited only by the number of officers in the department. In July there were 83 operations, in August (10 days of which I was alone) there were 103, and so far this month there have been 160, with no mastoids. I fancy that the latter will begin to bob up when the cold weather and acute infections of the upper air passages arrive. When this time comes the work will increase in many ways. For example, I have the Chief of the Medical Service report to me all cases of measles, etc., and the ears of these are examined daily, whether they have any symptoms or not. I have asked the same chief to issue orders that every case of earache shall be reported to me, no matter what time of day or night it may be. I hope thus to keep down to a minimum the number of mastoid inflammations and operations, and consequent days in hospital for the men. These plans, if carried out, will require a good-sized staff, and I hope that you will not reduce my present number and perhaps even find it possible later to increase it by one or two.

A further example of the coöperation between the Department of Internal Medicine and the Section of Otolaryngology is the following from Camp Sherman:

Extract from report dated September 14, 1918, from the Commanding Officer, U. S. Army Base Hospital, Camp Sherman, Ohio.

4. In conjunction with the Department of Internal Medicine and the Bacteriological Laboratory, an intensive study of 2,500 cases of tonsil infections is under way. The secretions from the tonsils and swabs from the adenoid region are taken by us, and a study of each case is carried out in the laboratory. In all cases where an infection exists the tonsils are enucleated, placed in sterile Petri dishes at once, and taken to the laboratory for bacteriological examination.

AIR-BORNE INFECTIONS

One of the great medical problems of the war is the prevention and control of droplet or air-borne infections. Typhoid fever and its kin have been eliminated, malaria conquered, tetanus robbed of its terrors, and venereal disease, in spite of human nature, is being subdued. General medicine and the specialties of bacteriology and otolaryngology are especially concerned with the problem. I

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came in touch with it last November while on a transport which carried 5,000 troops overseas. It is no exaggeration to say that the majority of the men became ill with tonsillitis, pharyngitis, or acute bronchitis during the voyage or within a few weeks after landing. The party of four, of which I made one, coughed steadily until it reached America again, four months later, and while in France two of the members went to the hospital, one narrowly escaping pneumonia. We were told at Blake's Hospital in Paris—Red Cross Hospital No. 2—that the most prevalent disease among the Americans was influenza and its complication—pneumonia. Practically every one came down with influenza during the first six months. At one time more than half the personnel of the hospital just mentioned was off duty with it. I returned home firmly convinced that the prevention of respiratory infections was, as I just said, one of the pressing problems of the war. I was especially uneasy about the transports, and still am.

I found Major McKernon, of the New York Post Graduate Hospital, at S——— busy trying to allay the paroxysmal cough which accompanied an epidemic of influenza, which at that time was crowding the hospital, by improvising a spray room in a corner of a ward by putting up sheets cubicle fashion and by vaporizing over oil stoves, which were kept continually burning in the center of the room, watery solutions of eucalyptus and thymol. This he found markedly quieted the racking cough. Before leaving England on the return trip I had the good fortune to visit the barracks of the Coldstream Guards. I went there to see in action a steam spray hut which was used for clearing up meningococcus carriers. It had been proved that the vault of the pharynx and the adenoid remains, so often present there, were the lodging places of the bacteria. For once the tonsils had proved innocent. In clearing up the carriers the problem was to disinfect the vault. In the beginning the men were required to sniff through the nose from the palm of the hand various alkaline solutions, and to gargle. Finally came the steam spray hut and the use of a one per cent solution of sulphate of zinc. In arriving at this special solution the medical officers had run the gamut of available germicides. Careful bacteriological tests had shown that the zinc sulphate solution gave the best results. The men were treated wholesale—and this is what appealed to me strongly—by marching 120 of them into the hut at once and exposing them to the spray for ten minutes. After this they dried off in another hut for another ten minutes. This was repeated every day for six days.

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My enthusiasm was aroused at once. There was cerebrospinal meningitis in the camps at home, and respiratory infections and influenza were common. In my enthusiasm I pictured one such hut in every cantonment and one ward at least so equipped. There was to be a hut at the port of embarkation for the men about to be herded on the ships and one such steam room in each large transport. My imagination inaugurated a similar system of huts in France. This you at once call extravagant and wild. The sane thing to do, you say, is to establish one hut and try it out. I agree, but I have not yet accomplished the building of one such hut.

I found on my return that there was one report on the steam hut duly catalogued and filed in the Surgeon General's Office. I was pleased to find that the problem of air-borne infections had been recognized in some of the cantonments and that steps had been taken to solve it. At Camp Lee, for instance, Major Day had established a gargle brigade, had weathered the derision it had caused, and had obtained favorable results. Further, Major Capps at Camp Grant had vigorously pushed the use of isolation by the cubicle plan and had introduced the use of gauze masks. Later an order was issued from the Surgeon General's Office making the use of the mask compulsory in all cases of infectious diseases in which the respiratory tract was involved. Another epidemic of influenza is upon us. The mask is being employed on a large scale to help check it. As I see it this is a move in the right direction. I should like to see, however, the use of the mask carried further. I feel that it would be worth while to try the effect of making every soldier on a troopship wear a mask while between decks, and for the sick to wear the mask at all times until convalescence is complete.

A very excellent and suggestive article on the "Prophylactic Treatment of Diseases of the Respiratory Tract," by First Lieut. Benjamin H. Minchew, stationed at Fort Logan H. Root, appeared in the September number of THE MILITARY SURGEON. Work of this kind carried on in all the base hospitals should bring worth-while results.

THE OBSERVATION TRIP ABROAD

A year ago this October General Lyster, then Colonel Lyster, headed a party of four which went to France for two months' temporary duty as observers of the medical care of the flyer and the methods adopted by the Medical Corps of the Allied Armies for the care of cases which come in the domain of opthalmology and

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otolaryngology. Colonel Lyster and Major Jones went in the interest of aviation and Major de Schweinitz and Major Mosher in the interests of ophthalmology and otolaryngology respectively. Major de Schweinitz and Major Mosher traveled together and visited the chief centers where the French and the English cared for such cases. In addition, they visited nine of the twelve American base hospitals then in operation in France. As things were just in the embryo stage with the American hospitals it was inevitable that the general hospital problems should come into the discussion. In these discussions there were some frank expressions of opinion by the men they met as to hospital problems and the place where the specialties fitted in or did not fit in. The report submitted to the Surgeon General has a certain historical interest in the light of what has happened since. The following paragraphs are quoted from it:

Major de Schweinitz and Major Mosher, visited the English hospitals where there were special eye centers, or centers for oral and plastic surgery. Otology is not yet recognized as a specialty in the English army and there were no centers to visit. In the English army the eye service is the best organized of the specialties. Next in excellence of organization come the oral and plastic centers, of which there are two in France and one in England. Then an advanced part of a French hospital sector was visited. In this it was found that the surgery was largely specialized. For instance, at one hospital of 3,000 beds 12 miles from the line, thoracic surgery and brain surgery were done by one man, bone and joint surgery by another, and wounds of the soft parts by a third. It was learned that early and thorough surgery had almost eliminated sepsis and that the Carrel treatment was seldom necessary. In this same sector, at a city perhaps 30 miles from the line, a special hospital for head cases was found and a special hospital for fractures. In other words, the French everywhere were specializing their surgery as much as possible.

Major Jones, as I said, was the only one of the party to go into Italy. On his return he confirmed what we learned from other observers who had been there, that the Italians have gone even further than the French in specializing their surgery. Every one who goes to Italy comes back greatly impressed with the efficiency of Italian surgery.

We reached France at a time when the American base hospitals were just getting on their feet. The first period of organization

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was over and their final buildings were under way. It is no secret that lumber was then scarce in France. The initial buildings, therefore, of almost every base hospital were summer hotels, French schools or monasteries. Most of these the French already used as hospitals. The French, however, turned them over to the Americans, who at once began to build additions in the shape of wooden huts.

We found the Johns Hopkins Unit established in a quaint old hunting lodge quite near the front. Over the low door there is some very elaborate sculpture and under this the legend, "God made me what I am." The Massachusetts General Hospital Unit is placed far in the rear and on the coast. As you enter the very clean hall of the administrative building, busts of Socrates, Plato and other Greek worthies look down upon you. Two splendid silk flags, one the American, the other the flag of the Red Cross, both still aglow with the blessing of the Bishop of Massachusetts, flank the foot of the broad staircase and catch the sunlight from a window above.

None of the American hospitals had been doing much surgery up to the time we left except one that was situated far north, and the surgery here was civil surgery. Most of the American base hospitals were principally occupied treating infectious diseases, of which they had a good supply, and pneumonia. The plan was just being put in operation of sending from each hospital an operating team to the casualty clearing stations of the English and the French, a plan copied from the English. It really will save the day, because without it the hospitals at the coast will never see any surgery, but remain as they were when we saw them—hospitals for treating cases of infectious disease coming off the transports, and convalescent hospitals for cases sent back from the more fortunately situated hospitals.

Naturally we became very much interested in the whole question of hospital organization and management. Besides reporting on how the specialties were cared for by the English and French, we reported on this larger subject to the Chief Surgeon, American Expeditionary Forces, and later to the Surgeon General. Our chief recommendations were that base hospitals should be placed as far forward as possible and that they should have radial control; that a consultant should be appointed for each branch of medicine and surgery and for each of the components of the Section of the Surgery of the Head; that a chief should be appointed for the Section of

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the Surgery of the Head, and a special head hospital established at a fitting time. We advised further that operating teams from each base hospital should be sent to the casualty clearing stations as a routine and that centers of instruction in brain surgery, oral and plastic surgery and the surgery of the eye and ear be established. The operating teams were being assembled, and some of the teaching centers were roughly in operation when we left. We advised that whatever consultants were appointed should supervise a sector radially from the front to the rear and be responsible from the front to the rear for the continuity of the treatment.

We learned, somewhat to our astonishment, that the greatest wastage of men in the various armies was caused by common and rather undignified diseases, namely, trench fever (probably due to the louse), boils and scabies. We found that last winter the great majority of our men were landed overseas ill with bronchitis or influenza, or soon came down with these diseases. When we left, a formidable committee, headed by Major Strong, was preparing to exterminate the louse.

ORGANIZATION OF SECTION OF SURGERY OF THE HEAD OVERSEAS

Overseas the condition of affairs with the specialties constituting the Section of Surgery of the Head is today as follows: Major Greenwood has been appointed chief consultant for ophthalmology and Major Blair for oral and plastic surgery. They have been in France now some four months. Lieutenant Colonel McKernon is the consultant for otolaryngology and Lieutenant Colonel Cushing has been appointed chief of the Section of Surgery of the Head and senior consultant for brain surgery. He has just sent for Major Bagley who, as you know, has been the active spirit in the Surgeon General's Office in trying to convince the surgeons that brain surgery is a specialty. What these two strenuous spirits—Colonel Cushing and Major Bagley—former master and former pupil, will do when they meet is anxiously awaited by those of us at home who know them.

The eye work for the troops of the American Expeditionary Forces is being managed in centers after the English and French plan, and these are under regional or sub-directors. I understand that a similar plan is to be put in force for oral and plastic surgery and otolaryngology. A special hospital building was being held for Base Hospital No. 115, our so-called head hospital. The Château-Thierry drive, however, used up all available hospital accommodations, and this building was taken for a general hospital. For the

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moment, therefore, the personnel of 115 has been distributed among the various centers. Whether it will be reassembled later remains to be seen. The following bit of significant news has lately come from the other side. Major Blair feels that oral and plastic cases cannot be held in France a sufficiently long time for efficient work to be accomplished on them. Before he went to France many of us felt that much of this work should be done before the men were sent to this country. Major Blair, however, does not feel this way. Lately—and I hope that I am not violating a confidence in saying this—a prominent orthopedic surgeon stationed at one of our American base hospitals in France has expressed the same view about the cases occurring in his specialty. He is about to ask for a transfer to this country in order to be here when the cases arrive. If these opinions are concurred in by the authorities in France, it will mean that adequate hospital accommodations should be provided in the United States. I am especially anxious because we have at present only one special hospital for head cases, that is, the one at Cape May.

FITTING INTO THE SERVICE

I have been interested in watching the various states of mind which seem to go with service in the Medical Corps. The men of the better class come in with a glow of patriotism, thankful that for them the decision is over and the change to army life accomplished. When they come in they ask nothing about rank, nothing about where they are to go. Their one idea is to be of service, and in the service. They are happy to be a part of the great military machine whose purpose so thrills them. They receive their assignment to duty, and nothing is heard from them during the few months in which they are fitting into the new life. Two things usually happen after—the work slackens, and they may have little to do, or they notice that men of less clinical experience and lower hospital or school position at home have higher rank than their own. The glow of enthusiasm with which they entered the service has become somewhat dim, and their medical work is now a matter of daily routine. This is the critical stage in a medical officer's army career. All have to pass through it and most of men do so successfully. A few, however, remain in the state of mind which goes with this stage and from now on are really unfit for military service. Those that are pushing write letters asking for a change of service or for a change in rank. The others keep what enthusiasm they can and work on, waiting for the war to be over.

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THE MILITARY POINT OF VIEW

The efficiency and the happiness of a medical officer in the army depend upon the quickness and thoroughness with which he acquires the military point of view. The end and aim of military medicine is to keep a man well or to get him quickly well and quickly to the front. The ideal military hospital should have few, if any patients, and these patients should stay but a short time. This means, for men who are on the sick report, that they make as few visits as possible to the Out-patient Department. This means, as a rule, that operations of choice are not encouraged and that in this country at least a very bare operative menu is set before the surgeon. This of course is as it should be, but it takes the civilian medical man a little time to acquire this new point of view, and until he does so he is continually running counter to the military machine. I should have more sympathy for a medical officer with his restricted operative list were it not for the fact that, if he is not busy operating, he can engage in the problems of preventive medicine, of bacteriology or of sanitation, or can turn to the ever-increasing administrative problems and learn how to deal with them. A surgeon whose horizon is bounded by operations and who does not turn to such medical opportunities will find his medical career in the Army a sterile job.

Men of large hospital experience, who naturally become the heads of sections, find that their work is chiefly executive. At first this is a keen disappointment, but the best men soon get the army point of view and become philosophical about the loss of clinical experience. At every cantonment base hospital it is possible to work up a splendid clinic if time could be given to this. Major operations require a protracted convalescence and, unless they are demanded by some emergency, the great purpose is not served by doing them. Operations of election, therefore, are ruled out. It is hard for men right from a busy hospital clinic to pass all these cases by. They have not been accustomed to think of the good of the cause first and the individual afterwards.

The Section of Otolaryngology has from the first willingly released to administrative work such of its men as have shown ability in this line, although their release has meant the weakening of the professional part of the service from which they were taken.

MEDICAL STANDARDS

The following observations are unpleasant to put on paper. I state them because they should be known in order to judge the war

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work of the specialties in their true light. The first is the painful fact that the training of the average medical man has been so meager. A few years ago our medical schools were rated; now the whole medical profession of the country for the first time has had its measure taken. The result should awaken the most complacent among us. I feel also that the halo of self-sacrifice that the medical profession allowed the public to place upon its brow for so many years has not been fully deserved. We have smugly worn the halo, however, sharing it only with the clergy. In the acid test we have proved to be mere mortals and no better than our fellows. It has been even a more painful surprise to discover that a good many medical officers were using this war, which has been called on America's part a war of honor, as an opportunity to take post-graduate courses or to break into a specialty. Self-styled specialists seem to have sprung from the ground everywhere. The following should, I suppose, have been expected—namely, that as a rule medical men use little discrimination when they recommend their fellow-members for positions in the Medical Corps of the Army. You cannot exactly blame a physician for making out the best case that he can for himself on his application papers, but when he has visited a clinic at a medical center for a few weeks only he gives a wrong impression when his blank reads as if he were a member of the staff of that institution. In times of depression I have felt that, in order really to rate an applicant, it was necessary to know him personally. The facts which have just been stated show the great usefulness of a school like that at Oglethorpe. Without it, it is impossible to rate many men. Lieutenant Colonel de Schweinitz, when he was establishing the Section of Ophthalmology here at Oglethorpe, once said to a candidate in righteous exasperation: "Sir, by what process of effrontery did you arrive at the conclusion that you were a qualified specialist?" Oglethorpe will help to protect the soldier of this war from such conscienceless individuals, but I am wondering who will protect the civilian population from them after the war is over.

THE INFLUENCE OF THE WAR ON MEDICINE

I should like to refer briefly to the influence of the war on medicine. I have in mind not only the great surgical advances but also the lesser changes, many of which are hard to put on paper, and many of which are as yet unrecognized, but the sum of which, I feel, will produce a profound change in our medical men and in their habits of practice. Some of the great changes, of course, are

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the new jaw work, in which the Americans have been among the leaders, and the new plastic surgery of the face. Gas infections have been conquered by early and thorough surgery. In addition, traumatic surgery of the lung has been revolutionized. Any day an epochal advance may be announced in the prevention and treatment of infectious diseases and diseases that are air-borne. Here lies the supreme opportunity of the war to go down in medical annals as forever memorable. So much for great advances fully or partly accomplished.

The following is not an advance exactly, although it may be considered as one in a negative way, namely, we have learned what is the average of medical attainment in this country. We find that it is humiliatingly low. In order to change this condition of affairs, many of the medical schools will have to raise their standards, and the standards for admitting medical officers to the practice of medicine must be made more stringent. This knowledge we owe to the war. A flood of medical literature has been put out in connection with the war, and this should have a marked influence on medicine in the future. All branches of medicine which bear on the war have been epitomized by medical officers who are authorities in their several lines. In the manuals so produced medicine has been reduced to its lowest terms. I predict that these books will be sought by medical students and practioners for years to come. So much of medicine never before has been put in small compass.

WHAT WE WILL CARRY BACK TO CIVIL LIFE

Never before have thousands of medical men entered on a completely ordered life and a life with a single ideal. Such is the life which we who are in the Army now lead. Not since medical school days have we lived the whole day through for medicine alone. The old happy days of internship have come back. We live in the hospital again, we mess with our fellows, we work and play together—and there are no bills to get out at the end of the month. When we learn how to make out our pay vouchers correctly a regular stipend awaits us on the first of the month. We have learned to write letters with the subject at the top so that those that receive them know at least what we started to write about. We have learned the value of words because we have been held responsible for them, and we have learned how to say "yes" and "no" without circumlocution. We find many of the polite conventions of speech or writing dispensed with, but our feelings are no longer hurt. We have learned to avoid the unessential and the trivial, and have hardened up and condensed

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all around. We have become familiar with some of the fundamentals of civil law and how to give every man a fair trial. Some of us have learned how to buy, to sell, to look ahead and to provide. Our army camps are units of modern civilization in miniature; no one can isolate himself from their activities, but must play his part. This ordered and full life cannot but make better physicians and better medicine itself. Think what army discipline will do for our civil hospitals when we get back, that is, if we have our way. There will be a respect for authority that there never has been before. All members of staffs, young and old, and without favor, will have their duties clearly set before them, and there will be shorter and more efficient methods of dealing with part time work and with the physician who comes in late from building up his private practice, the other fellow meanwhile doing his hospital work. As I see it, this war should prove the greatest tonic that the practice of medicine has had in our day.

COMRADESHIP

Just a word in closing about the comradeship of the Army. In order to speak of this justly one should be both preacher and poet. I, however, can do but little more than touch on it. You who make military medicine your life work — you who are regulars — have served as the leaven of the Army Medical Corps as it stands enlarged today. Its excellence in great part is due to your teaching. You have been very patient with those of us who came in from civil life, and we are very grateful. We have found your comradeship quick and full. Before this war you were working silently along and keeping your homes together with much less compensation than the medical officers from civil life feel they must have. You alone were ready for the emergency which is now here.

I have never realized until now the full meaning of the annual gatherings of the veterans of our Civil War. I confess to have been guilty of many unsympathetic thoughts about them. Their thinning ranks, and Memorial Day observances stirred me, but apart from this I was cold. This is not the way I feel now. I almost choke with apology and feel unworthy to touch the hem of their garments. They protected the home of my youth. I will help guard, with what strength I have, the homes of their age. I did not have youth to offer in this war; I took my place in our new army as one already gray—but I have gained the comradeship that comes with service.

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THE IMPORTANCE OF A HISTORY AS A MEANS OF DETECTING PSYCHOPATHIC RECRUITS[1]

By Passed Assistant Surgeon A. W. STEARNS, U. S. N. R. F.

I. INTRODUCTORY

THE function of a physician in a military establishment is somewhat different from that in civil life. In the latter we are accustomed to think of his work as humanitarian above all, while in the former the first reason for his presence is to help maintain the efficiency of a fighting machine, and the results of his humanitarian efforts, however great they may be, are a by-product of his total activity. Fortunately, these two functions usually coincide. Roughly speaking, his work may be divided into three phases, interlacing but somewhat distinct:

1. Selection and preparation of recruits.
2. Maintenance of health of personnel.
3. Repair of casualties exigent to service.

Obviously, barring contagious diseases and wounds, the extent of the second problem is dependent on the thoroughness of the first, and that of the third upon the second, and so when a recruit is selected the law of probabilities is used. That is, the problem becomes, which persons, if accepted, will be most likely to be healthy and fit when actually needed for military operations. In civil life an individual with a handicap can regulate his work to counterbalance the ill effect of such a handicap; in military service this is not possible, so the problem is, which individual will be most likely to be continuously fit so that he may be available at any moment when required. This is quite a complicated problem, compared, for instance, with examination for life insurance, which has to consider the length of life alone. There must be considered not only the likelihood of disability and the degree of such disability, but the amount of effort necessary to care for the individual while disabled and the chance of his restoration to duty. I think it can be shown that nervous or mental disease in an individual is more apt to result in disability, that the disability is greater and presents more difficulty in care with less chance of cure than in most any other class of disease. Furthermore, in many cases these conditions are due to a congenital, incurable defect. In others, when a

[1] Presented at the 74th Annual Meeting of the American Medico-Psychological Association at Chicago, June 7, 1918.

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cure is brought about, recurrence is to be expected. It is not possible to show the full extent of the psychiatric problem in the naval service by statistics, because the most numerous class of cases does not come to the attention of the medical department, but remains at present a problem of training and discipline. This, of course, is the feeble-minded group. Many studies, both in and out of naval service, have shown the similarity of individuals who are classed as inapt, undesirable, intractable, incorrigible and defective.

Again, the next group in size and importance, and in case of large military operations, if one may judge from the figures of European armies, perhaps the largest and most important group, is the psychoneurotic group. Statistics also fail to show the importance of this group in the service for two reasons: First, they are often ambulatory patients and so not recorded; and next, when admitted they are often classified under some prominent symptom such as headache, tachycardia, insomnia, etc. Nevertheless, statistics show the problem to be a large and constant one.

The relative damage by different groups is shown by the following table, being an average of a four-year period, 1913, 1914, 1915 and 1916, as taken from the reports of the Surgeon General.

TABLE I.—*Four-Year Average*, 1913, 1914, 1915, 1916.

Class	Division	Damage
8	Infective type (non-venereal)	606.72
9	Infective type (venereal)	479.14
20	Wounds and other injuries	322.35
3	Digestive system	258.62
14	Respiratory system	156.87
12	Motor system	151.75
11	Mind	115.45
7	Genito-urinary system (non-venereal)	112.64
13	Nervous system	111.34
5	Ear	89.99
2	Circulatory system	87.98
6	Eye and adnexa	76.91
17	Miscellaneous diseases and conditions	74.53
16	Herniae	59.83
15	Skin, hair and nails	39.59
18	Parasites	31.59
10	Lymphatic system	29.22
21	Poisons	19.11
19	Tumors	13.13
4	Ductless glands and spleen	9.76
1	Blood	2.92
	Average total damage, per year (men)	2,830.07

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Though the occurrence of nervous and mental disease is relatively small, the damage is high, being 8 per cent of the total. This proportion can be shown by statistics for the fiscal year 1916.

TABLE 2

	Cases		*Men*	*Per cent*
Total for the year	45,516	Total damage	2,955.50	or 6 +
Infectious diseases (non-venereal)	11,106	Damage	722.43	or 6 +
Infectious diseases (venereal)	10,261	Damage	546.95	or 5 +
Diseases of the mind	235	Damage	119.62	or 50 +
Diseases of the nervous system	427	Damage	92.33	or 21 +
Nervous and mental diseases.	662	Damage	211.95	or 32

This proportionately large damage is due to the large percentage of nervous and mental cases which were invalided from the service.

TABLE 3.—*Cases Invalided from the Service During the Fiscal Year*

	No. invalided	*Per cent*
45,516 cases	1,156	2 +
662 nervous and mental cases	220	33 +

This shows that a person apt to have nervous or mental disease is sixteen times more likely to be invalided from the service than a man having disease in general. These figures do not include several rather large groups of nervous diseases such as neurosis of the bladder, intestinal neurosis, etc., which are classified in other groups. Neither do they include the tremendous damage from feeble-minded and subnormal individuals discharged for disciplinary reasons. This loss cannot be definitely shown, but can be estimated from the report of the Adjutant Advocate General for 1916.

TABLE 4

Discharged as undesirable for inaptitude or with ordinary discharge, not recommended for re-enlistment	1,000
Discharged with dishonorable discharge	2,296
Total desertions for the year	1,681
Total prematurely lost to service	5,733
or 7.86 per cent of the total number of men handled for the year.	

Maj. Edgar King[2] has estimated that mental disease causes 39.9 per cent of discharges for delinquency from the army. One certainly takes no risk in assuming that mental disease, especially defect, is a large factor in military delinquency.

The case against nervous and mental disease is a strong one, and there is abundant evidence to show that, when present, it usually exists prior to enlistment or appears soon afterward. Its greater

[2] King, Edgar, The Military Delinquent. Quoted in *Mental Hygiene*, July, 1917.

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frequency in apprentices would indicate this. In King's analysis it is stated that 90 per cent existed prior to enlistment. All of the congenital conditions, of course, exist at time of enlistment. Becker's[3] figures, showing the frequency of occurrence of mental disease in the German army, illustrate this fact.

TABLE 5

	Per cent
Cases occurring in the first 3 months of service	37.8
Cases occurring in the second 3 months of service	28.2
Cases occurring in the third 3 months of service	21.6
Cases occurring in the fourth 3 months of service	12.4

In a series of cases invalided from service during the past year collected by the author,[4] 34 out of 35 existed prior to enlistment. Also a series of 2,000 consecutive arrivals examined at a training station showed the following conditions:

TABLE 6

Diagnosis	*Number*	*Per cent*
Feeble-minded	40	2.00
Psychoneurosis	17	0.85
Psychosis	2	0.10
Epilepsy	4	0.20
Stammering	5	0.25
Enuresis	2	0.10
Chronic alcoholic	2	0.10
Psychopathic personality	2	0.10
Defective delinquent	3	0.15
	4	0.20
	81	4.05

The medical causes for the rejection of recruits for the year 1916 were as follows:

TABLE 7

Errors of refraction	5,360
Under weight	4,507
Defective teeth	3,935
Flat or weak feet	3,534
Deformities	2,822
Varicose vein, or varicocele	2,331
Under height	1,623
Heart affections	1,439
Color perception defective	1,352
Genito-urinary (venereal)	914
Tuberculous or suspects	657
Mental disorder	231
Nervous condition	45
	276

[3] Becker, Theophil, Der angeborene Schwachsinn in seinen Beziehungen zum Militärdienst. Berlin, 1910. Quoted in *Mental Hygiene*, October, 1917.

[4] Stearns, A. W., The Psychiatric Examination of Recruits. *J. A. M. A.*, January 26, 1918.

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If the writer's percentages hold in the case of the 14,727 men enlisted in 1916, and there is every reason to suppose that they do, 588 of these have nervous or mental diseases, 294 being feeble-minded and 130 being psychoneurotic. It would be difficult to show that the risk was as great in any of the above rejected groups as in the group of nervous and mental diseases accepted.

Some reference should be made to the lessons already learned through the European War, though these are from conditions which our Navy will never have to meet and are as yet not thoroughly analyzed. This can probably best be done by quoting from the admirable report of Maj. Thomas W. Salmon, M. C., U. S. A.[5]

> No medico-military problems of the war are more striking than those growing out of the extraordinary incidence of mental and functional nervous disease (shell shock). Together, these disorders are responsible for not less than one-seventh of all discharges for disability from the British Army, or one-third, if discharges from wounds were excluded. . . . By their very nature, moreover, these diseases endanger the morale and discipline of troops in a special way and require attention for purely military reasons.

The proper attitude toward most cases of nervous and mental diseases can be summed up in two dicta: (1) Prevent enlistment, if possible; (2) dismiss from service as soon as detected.

THE DETECTION OF THE UNDESIRABLE RECRUIT

At present all enlistments in the Navy are by voluntary application on the part of the recruit. On account of the popularity of naval service many applications are being received. Many forced into service by the draft act are choosing the Navy, and also many boys between eighteen and twenty-one not eligible for army service wish to enter the Navy. The net result is that the Navy can get men easily, thus allowing very careful selection; therefore in considering the general medical problem of recruiting, three facts must be studied: (1) The source and quality of material available; (2) present methods and equipment for selecting material desired; (3) undesirable types most frequently not detected.

This problem is quite analogous to the employment of help in civil life, except that the relative importance of certain factors making for desirability is reversed. If a man wishes a job with a

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[5] Salmon, T. W., *Mental Hygiene*, October, 1917.

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large corporation, three factors are considered with the relative importance of each as follows: (1) Fitness for special work required (*i. e.,* Are you a machinist?); (2) general fitness for work (*i. e.,* record previous jobs); (3) physical fitness (*i e.,* Are you healthy?). Now, in the Navy the relative position of these factors is: (1) Physical fitness; (2) fitness for special work required; (3) general fitness for work. For the "unskilled labor" classes in the Navy, such as apprentice seamen, firemen third class, and landsmen for ship's cook, physical examination is, in practice, at present the sole criterion.

Studies of the occurrence of nervous and mental disability in the general population show that a nearly constant percentage of such disorders is to be found. For instance, the Nassau County Survey[6] shows that 1.72 per cent presented evidence of such disability. The fact that many of these disabilities are most common in childhood and in old age would make a smaller percentage for those ages eligible for naval service. Yet a recent study of 2,000 consecutive arrivals at a naval training station[7] showed approximately 4 per cent of nervous or mental abnormalities.

The estimates of the feeble-minded in the general population run close to one-half of 1 per cent. In this series 2 per cent were found, showing that feeble-mindedness is four times as common in the Navy as in the general population. To be sure, many with such a handicap manage to get along in the service, but why should the Navy enlist any man with a handicap when it can get the best? At the present moment it is a fact that thousands of perfect men are unable to get into the Navy, while thousands of feeble-minded and psychoneurotics are already in. With 100 per cent efficiency as an ideal, this should not be so.

There are certain factors which tend to drive the unfit into service. Of first importance is economic necessity. I have the word of several prominent social workers that military service has in the past year taken many most troublesome problems off their hands. The Adult Probation Department[8] for the city and county of San Francisco points with pride to the fact that nearly 10 per cent of their probationers are now in the service. Dr. Walter E. Fernald, of the Massachusetts School for the Feeble-Minded, in a personal

[6] Quoted in *Mental Hygiene,* October, 1917.

[7] *Loc. cit.*

[8] Annual Report of the Adult Probation Department for the city and county of San Francisco for the year ending December 31, 1917,

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communication has told me that many feeble-minded under his care are in the service. My own experience in the Out-Patient Department of the Boston Psychopathic Hospital has shown me that the changeable, unsettled psychopaths are often the first to seek service. I have already shown the attitude of courts in a recent article in the *Naval Bulletin*,[9] it being the custom to grant freedom to convicted men on condition of enlistment. Also there is a general impression that military discipline will reform an incorrigible or cure a psychoneurotic. This is possibly true, but one should not for a moment admit that the Navy in time of war can be used as a sanitarium or reform school.

There is a very prevalent idea that nervous and mental disease is especially difficult to detect. My own opinion is that no type of disease so definitely marks a man as mental disease, however slight. The marks are quite different from those of physical diseases and must be especially sought to be detected. To determine heart or lung disease, the chest is auscultated. The detect eye disease, vision is tested. At the present time no special effort is being made to detect mental disease other than casual observation. From the study of the Reports of the Surgeon General and Judge Advocate General and of the literature pertaining to military psychiatry, as well as from my own experience in naval service, the special psychiatric problems of the Navy are: (1) Feeble-mindedness, (2) psychoneurosis, (3) abnormal personalities, (4) epilepsy, (5) dementia praecox, (6) other psychoses and neuroses, (7) alcohol and drug addiction, (8) bed-wetting and stammering. (NOTE: The last two conditions are seen most frequently in neurotic and unstable individuals.)

Now the problem is: How may physicians not especially trained in psychiatry detect those with nervous and mental disease? Obviously, not by physical examination. No class of disease handicaps to the extent which mental disease handicaps, and therefore those affected can best be detected by the determination of their social and economic fitness.

Psychiatric study in the past few years has done much to throw light upon the cause of certain social problems. Especially has it shown the relation between crime, vagrancy, drug and alcohol

[9] Stearns, A. W., The Detection of Undesirable Candidates for Enlistment. *U. S. Naval Medical Bulletin*, July, 1918, Vol. XII, No. 3.

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addiction, pauperism and unemployment, and mental disease or defect. The sociological classification of abnormal subjects in the Nassau County Survey, quoted above, is of interest.

TABLE 8

	Per cent		*Per cent*
Retardation in school	10.6	Drug habits	0.3
Truancy, unruliness, etc.	1.3	Domestic maladjustment	0.9
Sex immorality	7.3	Medical cases	3.6
Criminal tendency	5.0	Other groups	23.0
Vagrancy	0.1	No mal adjustment	10.2
Dependency	17.6		
Inebriety	20.1	Total	100.0

This social and economic fitness can be determined by any intelligent man by analysis of a brief history. Recruiting physicians, if they have such histories, will soon become expert in their interpretation. In his report for 1917 the Surgeon General[10] deplores the lack of history, and states that it is "too often made in a perfunctory manner." The history taken on the application for enlistment is even more perfunctory and is of little medical importance at present.

An exact psychiatric diagnosis is not essential. If an applicant appears to be a social or economic problem, it does not matter especially whether this is due to tuberculosis, dementia praecox, feeble-mindedness, abnormal personality or what not. His problem should not be shouldered by the Navy, until man power gets to be a much more serious question than at present. The entire absence of the feeble-minded group among such recruits as hospital apprentices second-class, landsmen for yeomen, and landsmen for electricians (radio) shows that, where discrimination is made in selecting the applicants, no defectives are recruited. As for the other groups, many men are now rejected as the result of a superficial judgment upon their fitness, when analysis would show their desirability. The following scheme for determining the social and economic fitness of recruits is suggested:

A minimum life history should be taken of each candidate for enlistment. For the past year the following card has been satisfactory at the United States Naval Training Station, San Francisco, California:

[10] Annual Report of the Surgeon General, 1917, p. 36.

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Name..... Date..... No.....

Age..... Civil Cond..... Rate.....

Home..... Enlisted.....

P. E..... Appearance.....

School .....

.....

Occupation .....

.....

Medical History.....

.....

Alc..... Arrests.....

Symptoms..... Fitness 1-2-3

As each question is asked, clues should be followed. The factors of special importance in forming an estimate of the individual seem to be:

1. *Age.*—Quite a percentage of the 18-year-old boys are either 16 or 17 years old. This often means that they have run away from home or have enlisted fraudulently; also many of the bed-wetters are in this 18-year-old group, so a little closer attention should be paid to the 18-year-old than to others. Also the men above thirty need a little closer inspection, because of the greater frequency of cerebrospinal syphilis and chronic alcoholism.

2. *Civil Condition.*—Men who are separated or divorced should have a little closer scrutiny because of the association between domestic difficulties and psychopathy.

3. *Relation Between Home and Place of Enlistment.*—This is quite important, especially in younger applicants. It is unlikely that a boy under twenty would be applying for enlistment in a distant part of the country if his home life and social relations are normal.

4. *Appearance.*—Under this heading general attitude and manner should be included. Although appearances are very deceitful, one soon learns to detect a dull, childlike reaction of the imbecile, and the dulled, apathetic reaction of the epileptic or dementia praecox case.

5. *School.*—The grade reached in school and history of retardation are very important in detecting the feeble-minded and epileptic. The eighth grade usually and high school always rules out mental defect. Very few epileptics and psychopaths graduate

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from high school. One should not confuse the rustic with the imbecile, but differential diagnosis is necessary to make the distinction.

6. *Occupation.*—Holding a permanent, responsible job usually rules out nervous and mental diseases. The imbecile's activities are confined to unskilled labor and his terms of employment are very short. The psychoneurotic, insane and epileptic rarely hold a position long.

7. *Medical.*—At least half the epileptics will admit attacks if properly questioned. The same applies to bed-wetters. Practically all of the psychoneurotics give a history of previous ill-defined pains, dizzy attacks or weaknesses.

8. *Arrests.*—The relation between delinquency and nervous and mental diseases is well known. A history of arrests for minor offenses and of reform-school residence is easy to obtain.

As a result of the above analysis it is possible to place candidates for enlistment in three groups:

1. Those obviously not suffering from nervous or mental diseases, comprising at least 80 and probably 90 per cent of applicants.

2. Those suspected to be suffering from mental diseases, comprising from 5 to 15 per cent of applicants.

3. Those obviously suffering from nervous or mental diseases, comprising from 1 to 5 per cent.

As a result of this the definite cases should be rejected. The doubtful ones should be more thoroughly studied. Usually consulting police records of the home town, insisting upon the references being *bona fide* and investigating these references would be sufficient to determine the desirability of the candidate. Just as at the present time an applicant suspected of having syphilis is required to furnish a Wassermann report, so these suspects should be required to furnish a certificate from a local psychiatrist.

If the above method could be put into operation in all recruiting offices some would use it well and some poorly, but it would unquestionably result in a tremendous diminution in the number of psychopaths received by the Navy and would require very little additional effort, as experience has shown that it is possible to train a hospital apprentice to do this work very well, he merely calling to the attention of the physician the suspects.

Conclusion.—(1) Nervous and mental diseases are an important factor in military medicine; (2) no special effort is being made to detect them by recruiting stations; (3) the intelligent use of a brief social history would go a long way towards solving the psychiatric problem of the Navy.

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EPIDEMIC CEREBROSPINAL MENINGITIS AT CAMP WHEELER, GEORGIA

By 1st Lieutenant HAROLD B. SCOVERN
Medical Corps, U. S. Army

FROM the date of opening the base hospital, October 17, 1917, to February 1, 1918, there have been admitted twenty-five cases of epidemic cerebrospinal meningitis. There has not been a true epidemic of the disease in this camp, the cases being purely sporadic in nature. There have been two cases in only one company; in this company a case developed about the middle of November and another in the latter part of December, so there is no direct proof even in this instance that the disease was of an epidemic character. The majority of cases, however, came from one regiment.

Twenty-two cases were positively confirmed by isolation of the diplococcus intracellularis meningitidis from smears and cultures, and by agglutination of the spinal fiuid of the affected individuals. Thirteen of this series died and nine recovered. In the remaining three cases, no causative organism was isolated, but the clinical picture was so clear and the response to specific treatment so characteristic in two who recovered, that there is little doubt of the diagnosis. Two recovered and one died, making a total of fourteen deaths and eleven recoveries in twenty-five cases.

While our numbers have been small, the wide difference in the type of cases dealt with has been most striking, which is only another indication of the sporadic nature of the disease in this camp. We are therefore inclined to divide our case reports into three separate groups: moderate, severe, and fulminating.

MODERATE GROUP

In this type of case the patient was admitted to the hospital complaining of headache of from twelve to twenty-four hours' duration. There was usually a chill shortly after the onset of the headache; occasionally vertigo preceded the development of headache, the mentality was not greatly disturbed, the temperature ranged between 100° and 105°; the pulse rate between 100 and 130; respiration rate between 16 and 32. These patients, as a rule, were hypersensitive and all the clinical signs were present, but less marked than in the other groups. Rigidity of the neck has been the most pronounced and constant sign; the Kernig, Brudzinski, Babinski and tendon reflex signs in the large percentage of this type were

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questionable on admission, but later developed quite typically. Skin lesions were conspicuous by their absence. The spinal fluid was turbid, under pressure, and contained large numbers of pus cells and the diplococcus intracellularis meningitidis. In Cases 5 and 7, however, no causative organisms were isolated, in spite of repeated attempts, by smear or culture.

Twelve of our cases fell under this group, of which two proved fatal and ten recovered. This type responds well to specific treatment and is undoubtedly the type met with in large epidemics.

SEVERE GROUP

In this type of case the individual complained of headaches of twelve to eighteen hours' duration and a severe chill shortly before admission. The mentality was greatly impaired; the patient was markedly toxic, and in a semicomatose condition from which he was aroused with difficulty. The temperature ranged between 103° and 105.6°; the pulse rate between 90 and 130 per minute; the respiratory rate from 12 to 30. The physical signs were well marked; rigidity of the neck was prominent; Kernig pronounced; Babinski, Brudzinski, Oppenheim, Gordon, and increased tendon reflex signs (a small percentage showing the arm Kernig) were all present. Skin lesions were not observed in a single case. The spinal fluid was quite characteristic in all but one case, in which no causative organism was isolated. Four of our patients were classed in this group; three died and one recovered.

FULMINATING GROUP

In this type the onset has been sudden, the headache severe in character, followed in two to four hours by marked toxicity and a comatose state, total unconsciousness and occasional convulsions. The temperature ranged between 103.6° and 105°; pulse rate 85 to 130; and the respiratory rate 6 to 30 per minute. Death occurred in twenty-four to fifty-six hours from the onset of the initial symptoms, and within four to thirty-six hours after admission to the hospital. The physical signs were very characteristic and the spinal fluid typical in all cases. One-third of the group showed skin lesions of the spotted-fever type. It is to this fulminating group that we wish to call particular attention, for the high percentage of this type in our series is rather striking. Nine of our cases have been of this type, all of which were fatal. In the majority of this type, respiratory depression and cyanosis were striking features. In four espe-

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cially the clinical picture was so plain that we did not hesitate to consider intracranial pressure as the cause of this marked respiratory depression. While we were late in hitting upon a plan definitely to relieve this condition and at the same time be of benefit in the curative nature of the disease itself, we eventually, after seeing the intraspinal and intravenous methods utterly fail in making any impression upon the course of the disease, resorted to direct puncture of the lateral ventricle, withdrawing the cerebrospinal fluid and introducing antimeningitic serum into the lateral ventricle. The results were highly encouraging, so much so that in the future we shall not hesitate in the least, on the slightest provocation, to use this method at the earliest possible moment in this particular class of cases; and while we realize that the greater number will die regardless of what form of treatment is instituted owing to the severity of the infection, we believe that a certain number will be saved by this method that would otherwise surely die.

METHODS USED TO PREVENT AN EPIDEMIC

The affected individuals are isolated in a separate ward and the strictest precautions observed by those who come in contact with them for their own protection and to prevent them being factors in the transmittance of the disease to others.

As soon as the diagnosis is confirmed by finding the diplococcus intracellularis meningitidis in the spinal fluid, the company from which the individual came is placed under quarantine. His tentmates and actual contacts are isolated, and the following day posterior nasal cultures are taken of each member of the company to locate carriers. Those showing positive cultures are immediately removed to the quarantine station and the quarantine lifted from the company. At the quarantine station the carriers are grouped together and held there until after three successive negative cultures. Capt. R. L. Wilson, in charge of the laboratory, has so perfected the technique in this work that, with his assistants, six hundred individuals can be examined daily. The entire division will eventually have been cultured, as companies are cultured as fast as possible, regardless of whether or not there has been a case of meningitis in the regiment, to segregate all carriers.

TREATMENT OF CARRIERS

At present there are seventy-two carriers in the quarantine station. Various preparations and methods have been used to clear

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up these carriers, dichloramine-T being chiefly used, but with no great degree of success, as it has required a long interval of time to make them culture negative. Recently these carriers have been treated with chlorine gas in the gas house with very good results. Forty carriers, so treated once, all showed negative cultures except one.

PLAN OF TREATMENT FOLLOWED

As soon as the cases are admitted, a spinal puncture is made to confirm the diagnosis. If the fluid is under pressure or of a cloudy consistency, from 60 to 95 c.c. of fluid is removed, and from 30 to 60 c.c. antimeningitic serum administered intraspinally, it being the intention to give 20 c.c. less serum than fluid recovered. The injections are repeated at twelve to twenty-four hour intervals according to the severity of the condition and the response to treatment, until all symptoms have disappeared and the temperature has been normal for four days with clear spinal fluid. It is of utmost importance that the treatment be continued for several days after the fluid has become clear and the temperature normal, for if it be discontinued during the first days of normal temperature, these cases will again develop a low continuous fever, ranging around 100°, and have a prolonged convalescence. (See Cases 1 and 2.) The complete overwhelming of the last remaining meningococcus can only be accomplished by this plan, and the so-called state of chronic meningitis will be obviated in all probability in the majority of instances.

A great deal has been said about "dry" spinal punctures, and some believe that this is a frequent occurrence. So far as is known, the number of cases upon record that showed fluidless membranes at autopsy are few and far between, so that it seems reasonable to believe that the greater number of "dry" taps are due to failure to get into the spinal canal. However, we will admit that during the course of treatment we occasionally fail to get a flow of fluid when the canal has been entered, but, on going higher up, a flow of spinal fluid is always obtained.

To obtain the maximum amount of spinal fluid from each puncture is to be desired, as the more fluid removed, the greater amount of serum can be given. A useful procedure to follow is: after the fluid has stopped coming from the needle, have the individual count to one hundred, taking as few inspirations as possible (or any exercise to collapse the lungs), and the fluid will again come to the

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needle. In this way from 10 to 20 c.c. more spinal fluid will be obtained.

In the severe and fulminating types, we have combined the intraspinal and intravenous methods, giving 30 c.c. to 40 c.c. serum intraspinally and 60 c.c. intravenously. Nine cases were so treated with no results, so our results with the intravenous method have not been as encouraging as those of others who have had greater experience with it. In no case did we see improvement in severe and fulminating types following the intravenous administration of antimeningitic serum, for all our cases who received serum in this manner died within four to twelve hours after the treatment.

There cannot be too much stress laid on the selection of a potent and active serum, there being wide difference in the various commercial serums put on the market, both in their physical properties and their therapeutic effect. The Rockefeller Institute serum has been the most satisfactory, while one commercial serum has been highly unsatisfactory. The majority of this preparation is of a deep red color, indicating that it contains a large quantity of hemoglobin, and seldom has it had the proper therapeutic effect upon controlling the disease, and we are inclined to believe that it is deficient in agglutinating power for the particular strains of meningococcus that we have had to deal with. Another commercial serum and the New York Board of Health serum have been active and given good results.

As soon as the patients have gained sufficient strength after being out of bed for a few days, they are given gradually increasing physical exercises, the same exercises being used as are prescribed in the "Service Manual for Sanitary Troops." This is of double value, as it brings out any paralysis that may be present, however slight, and helps enormously in breaking up rigidity and contractures of the muscles, as well as having a beneficial effect upon restoring and reconstructing those muscles actually paralyzed.

CASE REPORTS

Moderate Group

Case 1.—C. L. Male, aged 21. *Onset:* October 20, 1917; headache, dull mentality; T. 103.3°, P. 90; R. 30. *Physical Signs:* Characteristic. *Spinal Fluid:* Characteristic. *Duration:* Forty-two days. Recovery. *Treatment:* Fourteen intraspinal injections of antimeningitic serum averaging 30 c.c. each. *Complications:* Biceps of right arm contracted; paralysis of the deltoid muscle of the right shoulder. *Interesting Features:* After having received one intraspinal injection of 20 to 30 c.c.

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antimeningitic serum each day for eleven days, temperature fell to normal and spinal fluid was clear, so treatment was discontinued. Four days later the temperature rose to 100° and remained at that figure for three weeks. Physical condition did not improve; on the contrary declined. Several spinal punctures were done during this time and fluid removed. This was clear and contained no cells or organisms, so no treatment was given. On the thirty-eighth day of the disease, treatment was again instituted, 40 c.c. of antimeningitic serum being given each day for three days. Following the first treatment temperature fell to normal and has remained normal ever since. Two other injections were given and the patient made a rapid convalescence.

Case 2.—A. M. Male, aged 21. *Onset:* November 14, 1917; chill and headache; T. 104°, P. 124, R. 24; mentality dull. *Physical Signs:* Characteristic. *Spinal Fluid:* Characteristic. *Duration:* Twenty-eight days. *Treatment:* Twelve intraspinal injections of 20 to 30 c.c. antimeningitic serum. Recovery. No complications. *Interesting Features:* This case was like No. 1. After receiving eight intraspinal injections of antimeningitic serum, the temperature fell to normal and the spinal fluid became clear, so treatment was discontinued. Three days later the temperature went up to 101.2° and ran continuously near this mark. Several spinal punctures were done in the meantime. The fluid was clear and contained no cells or organisms, so no serum was given. On the twenty-fifth day of the disease, treatment was again instituted, and after receiving one injection of 30 c.c. antimeningitic serum the temperature fell to normal. On each of the following three days, 30 c.c. of serum were given. Patient made a speedy convalescence.

Case 5.—J. N. Male, aged 22. *Onset:* November 28, 1917; severe headache, dull mentality; T. 104°, P. 80, R. 30. *Physical Signs:* Characteristic. *Spinal Fluid:* Characteristic, except that no organisms were isolated. *Duration:* Twelve days. *Treatment:* Eight intraspinal injections of 40 c.c. each, antimeningitic serum. Recovery. No complications. *Interesting Features:* In this case, as in Cases 7 and 15, no causative organism was isolated, but the response to serum treatment was so typical that there was little doubt of the diagnosis of epidemic cerebrospinal meningitis.

Case 6.—F. S. Male, aged 24. *Onset:* December 3, 1917; headache, nausea and vomiting; petechial eruption over body. T. 103.6°, P. 80, R. 20. *Physical Signs:* Characteristic, but not marked. *Spinal Fluid:* Characteristic. *Duration:* Eighteen days. Death on December 23, 1917. *Treatment:* Fourteen intraspinal injections of 40 c.c. and two intravenous injections of 60 c.c. antimeningitic serum. *Complications:* Acute endocarditis, transverse myelitis and paralysis of external rectus muscle of right eye. *Interesting Features:* The first eight days of disease, patient improved after each treatment and temperature was normal. On the eighth day, paralysis of the right external muscle was

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noted with resulting internal strabismus and homonymous diplopia in the right eye. On December 13 there was a sudden elevation in temperature to 105.6°; a soft systolic murmur was made out at the apex, leucocytes were increased, but blood culture was negative. A diagnosis of acute endocarditis was made, and temperature remained septic in type till death. On December 19 a total paralysis of the entire lower extremity from the hips down was noted, with absence of pain and temperature sense, while touch and location were preserved.

Case 7.—M. W. Nurse, female, aged 25. *Onset:* December 3, 1917; headache, chill, mild delirium; T. 105.4°, P. 110, R. 28. *Physical Signs:* Characteristic. *Spinal Fluid:* Characteristic, except that no organism was isolated. *Duration:* Nine days. Recovery. *Treatment:* Six intraspinal injections of 40 c.c. antimeningitic serum. *Complications:* Weakness of all muscles of the right side with contracture of the pectoralis major and minor muscles of the right side. *Interesting Features:* Same as in Case 5.

Case 9.—Z. R. Male, aged 29. *Onset:* December 4, 1917; headache, slight mental dullness; T. 104.4°, P. 82, R. 28. *Physical Signs:* Questionable. *Spinal Fluid:* Characteristic. *Duration:* Eight days. Recovery. *Treatment:* Six intraspinal injections of 40 c.c. antimeningitic serum. *No Complications.*

Case 12.—R. R. Male, aged 23. *Onset:* December 8, 1917; headache, chill and mild delirium; T. 103.6°, P. 100, R. 20. *Physical Signs:* Characteristic. *Spinal Fluid:* Characteristic. *Duration:* Fifteen Days. Recovery. *Treatment:* Nine intraspinal injections of 40 c.c. antimeningitic serum. *Complications:* Paralysis of the right deltoid muscle.

Case 17.—J. G. Male, aged 24. *Onset:* December 27, 1917; headache, chill, nausea and vomiting, the latter almost pernicious in type; T. 103.4°, P. 85, R. 20. *Physical Signs:* Not marked, but characteristic. *Spinal Fluid:* Characteristic. *Duration:* Eight days. Recovery. *Treatment:* Six intraspinal injections of 40 c.c. antimeningitic serum. *Complications:* Right deltoid paralysis. *Interesting Features:* Vomiting in this case was a severe and persistent occurrence that caused no little anxiety.

Case 20.—J. J. Male, aged 27. *Onset:* January 10, 1918; headache; T. 104°, P. 100, R. 24. *Physical Signs:* Questionable, but suspicious. *Spinal Fluid:* Characteristic. *Duration:* Twelve days. Recovery. *Treatment:* Eight intraspinal injections of 40 c.c. antimeningitic serum. *No Complications.*

Case 21.—F. V. Male, aged 18. *Onset:* January 14, 1918; headache, chill, vomiting and slight mental dullness; T. 104.2°, P. 110, R. 22. *Physical Signs:* Not marked, questionable. *Spinal Fluid:* Characteristic. *Duration:* Seventeen days. Recovery. *Treatment:* Eleven intraspinal injections of 40 c.c. antimeningitic serum. *Complications:* Paral-

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ysis of the external rectus muscle of the right eye. *Interesting Features:* The third day after onset of disease, retraction of the head developed that eventually drew the head back until it rested between the scapulae.

Case 22.—G. F. Male, aged 19. *Onset:* January 17, 1918; headache and chill; T. 102.2°, P. 100, R. 20. *Physical Signs:* Questionable, but suspicious. *Spinal Fluid:* Characteristic. *Duration:* Nine days. Death on January 26. *Treatment:* Nine intraspinal injections of 40 c.c. antimeningitic serum. *Interesting Features:* The serum used seemed to have little effect upon the course of the disease; two hours before death, patient developed marked respiratory depression and died very suddenly. Autopsy revealed both lateral ventricles filled with pus.

Case 23.—P. L. Male, aged 20. *Onset:* January 18, 1918; headache and chill; T. 101°, P. 88, R. 24. *Physical Signs:* Characteristic. *Spinal Fluid:* Characteristic. *Duration:* Seven days. Recovery. *Treatment:* Four intraspinal injections of 40 c.c. antimeningitic serum. No complications.

Severe Group

Case 10.—A. L. Male, aged 28. *Onset:* December 4, 1917; headache, chill, delirium, prostration; T. 103°, P. 120, R. 30; total unconsciousness within twelve hours of onset. *Physical Signs:* Characteristic. *Spinal Fluid:* Characteristic. *Duration:* Two days. Death December 6, 1917, thirty-six hours after admission. *Treatment:* Two intraspinal injections of 40 c.c. antimeningitic serum and one intravenous injection of 60 c.c. antimeningitic serum.

Case 11.—C. T. Male, aged 21. *Onset:* December 7, 1917; severe headache, chill, prostration and gradually developing coma; T. 104.6°, P. 130, R. 28. *Physical Signs:* Characteristic. *Spinal Fluid:* Characteristic. *Duration:* Fourteen days. Death December 21. *Treatment:* Fourteen intraspinal injections of 60 c.c. antimeningitic serum. *Interesting Features:* Disease was never affected by treatment. Three days after admission, wide dilatation of the pupils developed and they did not react to light or accommodation until two days before death, when normal reaction returned for a period of eighteen hours, followed by dilatation.

Case 14.—R. J. Male, aged 24. *Onset:* December 17, 1917; headache, chill, prostration, followed by total unconsciousness within twelve hours of onset; T. 104.2°, P. 126, R. 30. *Physical Signs:* Characteristic. *Spinal Fluid:* Characteristic. *Duration:* Eight days. Recovery. *Treatment:* Six intraspinal injections of 40 c.c. antimeningitic serum. *Complications:* Paralysis of the peroneus longus and brevis digitorum of the right leg. *Interesting Features:* Four hours after receiving first intraspinal treatment, patient regained consciousness.

Case 15.—D. G. Male, aged 27. *Onset:* December 18, 1917; headache, marked prostration, mild delirium, semicomatose within eight hours

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after onset of disease; T. 105.2°, P. 120, R. 30. *Physical Signs:* Characteristic. *Spinal Fluid:* Characteristic, except that no organisms were isolated. *Duration:* Seven days. Coma never cleared. Death December 25. *Treatment:* Seven intraspinal injections of 40 c.c. antimeningitic serum and two intravenous injections of 60 c.c. *Interesting Features:* Same as in Cases 5 and 7.

Fulminating Group

Case 3.—J. C. Male, aged 24. *Onset:* November 21, 1917; headache, followed in a few hours by a state of absolute coma; T. 104°, P. 120, R. 20; when admitted to the hospital was markedly toxic. *Physical Signs:* Characteristic. *Spinal Fluid:* Characteristic. *Duration:* Forty-eight hours. Death November 23. *Treatment:* Two intraspinal injections of 30 c.c. antimeningitic serum. *Interesting Features:* None, except the rapidity of the coma, so characteristic of this group.

Case 4.—J. B. Male, aged 22. *Onset:* November 24, 1917; headache, followed by coma twelve hours after onset; T. 100°, P. 100, R. 30. *Physical Signs:* Characteristic. *Spinal Fluid:* Characteristic. *Duration:* Fifty-two hours. Death November 27. *Treatment:* Four intraspinal injections of 30 c.c. antimeningitic serum.

Case 8.—F. S. Male, aged 25. *Onset:* December 3, 1917; chill, headache, with total unconsciousness four hours after first complaint; T. 104°, P. 110, R. 12. On admission to hospital was cyanotic and respirations were cerebral in type. *Physical Signs:* Characteristic. *Spinal Fluid:* Characteristic. *Duration:* Twelve hours. Death December 3, ten minutes after admission to hospital. No treatment. *Interesting Features:* The rapidity with which the disease ran its course and the fulminating character of the infection.

Case 13.—I. J. Male, aged 23. *Onset:* December 9, 1917; headache, chill, with a rapidly developing coma which was complete in four hours after initial onset; T. 104.2°, P. 130, R. 16. On admission to the hospital was very cyanotic and suffering from respiratory depression. *Physical Signs:* Characteristic. *Spinal Fluid:* Characteristic. *Duration:* Fourteen hours. Death four hours after admission. *Treatment:* One intraspinal injection of 40 c.c. antimeningitic serum. *Interesting Features:* Same as in Case 8.

Case 16.—H. D. Male, aged 20. *Onset:* December 25, 1917; headache, followed with total unconsciousness and complete coma within four hours of onset; T. 104°, P. 100, R. 10. When admitted to the hospital was very cyanotic and respirations were depressed. *Physical Signs:* Characteristic. *Spinal Fluid:* Characteristic. *Duration:* Sixteen hours. Death six hours after admission to the hospital. *Treatment:* One intraspinal injection of 40 c.c. antimeningitic serum. *Interesting Features:* Same as in Case 8, and like Cases 8 and 13, suffered with intracranial pressure; purpuric eruption about the shoulders.

Case 18.—R. A. Male, aged 20. *Onset:* December 31, 1917; violent

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attack of vertigo, headache, with total unconsciousness and absolute coma one hour after initial symptoms; T. 103.6°, P. 110, R. 16. *Physical Signs:* Characteristic. *Spinal Fluid:* Characteristic. *Duration:* Sixteen hours. Death. *Treatment:* One intraspinal injection of 40 c.c. antimeningitic serum and one intravenous injection of 60 c.c. *Interesting Features:* Same as Case 8.

Case 19.—J. C. Male, aged 25. *Onset:* January 1, 1918; headache, chill, followed by total unconsciousness and absolute coma within four hours of initial symptom; T. 105.2°, P. 112, R. 12. *Physical Signs:* Characteristic. *Spinal Fluid:* Clear; under pressure contained no leucocytes, but literally teemed with a pure culture of meningococci. *Duration:* Sixteen hours. Death. *Treatment:* One intraspinal injection of 40 c.c. antimeningitic serum and one intravenous injection of 60 c.c. *Interesting Features:* Same as in Case 8.

Case 24.—G. B. Male, aged 24. *Onset:* January 18, 1918; made no complaint; went to bed feeling well. Six hours later was found in bed in a comatose state; T. 104.6°, P. 130, R. 10. When admitted to hospital was very cyanotic and breathing but ten per minute. *Physical Signs:* Characteristic. There was purpuric eruption over the body two hours before death. *Spinal Fluid:* Characteristic. *Duration:* Forty-eight hours. Death thirty hours after admission to hospital. *Treatment:* 95 c.c. of spinal fluid was removed on admission and 40 c.c. antimeningitic serum administered intraspinally. A subcutaneous dose of 1 c.c. was given at the same time and followed in an hour by 60 c.c. antimeningitic serum intravenously. There was no improvement and by this time respiration had dropped to four per minute. A spinal puncture was again performed and 60 c.c. fluid removed (no more could be obtained) and 20 c.c. antimeningitic serum injected intraspinally. Two hours later patient had stopped breathing altogether; pulse was fair; air entered the lungs only by artificial respiration. Cyanosis was extreme and patient had all the signs of impending death. Decompression was performed and lateral ventricle tapped, 30 c.c. fluid removed and 15 c.c. antimeningitic serum injected into ventricle. There was immediate improvement and four hours after operation patient regained consciousness to ask for a urinal. The respiratory rate had returned to normal, and cyanosis entirely cleared up. *Interesting Features:* This patient died sixteen hours after the operation, but would undoubtedly have died twelve hours sooner had this procedure not been used.

Case 25.—R. L. Male, aged 22. *Onset:* January 19, 1918; severe headache; stupor which developed into absolute coma six hours after onset; T. 104°, P. 122, R. 28. *Physical Signs:* Characteristic. *Spinal Fluid:* Characteristic. *Duration:* Eighteen hours. Death twelve hours after admission to hospital. *Treatment:* One intraspinal injection of 40 c.c. antimeningitic serum. *Interesting Features:* Two hours after treatment patient suddenly became cyanotic and died within five minutes.

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ASSOCIATION NOTES

PROCEEDINGS OF THE TWENTY-SIXTH ANNUAL MEETING OF THE ASSOCIATION OF MILITARY SURGEONS OF THE UNITED STATES, HELD AT THE MEDICAL OFFICERS' TRAINING CAMP, CAMP GREENLEAF, CHICKAMAUGA PARK, GEORGIA, OCTOBER 14, 15 AND 16, 1918.

THE MINUTES OF THE MEETING

The twenty-sixth annual meeting of The Association of Military Surgeons of the United States convened at Camp Greenleaf, Ga., October 14, with Capt. George A. Lung, M. C., U. S. Navy, President, in the chair.

The sessions were all well attended, but, due to the epidemic of influenza, there were not as many visitors as had been anticipated.

The first session was held in the Y. M. C. A. Auditorium at 9 a. m., October 14, the meeting being called to order by Col. W. N. Bispham, M. C., U. S. Army, Commanding, Camp Greenleaf, Ga. Our president, Capt. George A. Lung, M. C., U. S. Navy, addressed the meeting as follows:

About twenty-six years ago a company of gentlemen of the medical profession, allied with the National Guard, met in Chicago as the guests of Gen. Nicholas Senn, then Surgeon General of Wisconsin, and organized a special medical society, declaring that the purpose of the organization would be "an association of military surgeons of the National Guard for the advancement of military and accidental surgery and all things pertaining to the health and welfare of the civilian soldier."

To those of us who know intimately the Association of Military Surgeons as it is today, its relations, and the great things for which it stands, this beginning looks almost like a humble origin. And yet, viewed in the light of the history of these times, the conditions that prevailed then, and particularly since that time, it is the beginning of the Association of which we are now members and it has for us great interest and importance.

At the first meeting, officers were elected, a seal and badge selected, and a resolution wisely adopted urging that state laws be enacted requiring medical officers of the National Guard to qualify by examination before being commissioned, for it appears that some medical officers then secured their billets by political preferment, and in a few instances it is said the billets were filled by men with little or no medical knowledge.

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The second annual meeting was held at St. Louis. It is now conspicuous because of the address of the then president, Gen. Nicholas Senn. On that occasion he said in an address entitled, *The Mission of the Association of Military Surgeons of the National Guard of the United States:* "If freedom, protection and prosperity are the elements which are productive of patriotism, every citizen of the United States is, or should be, imbued with love and gratitude of his country and ready to defend it in times of danger."

One can fancy some of his listeners regarding such expressions uttered at that time as turgid oratory commonly displayed in Fourth-of-July celebrations. In the light of events of this day, we must regard them as a keenness of vision akin to prophecy.

I am informed that at this meeting the Surgeon Generals of the Army and Navy were made honorary members, but the personnel of the medical corps of the Army and Navy did not become members until some time later.

It is also recorded that much discussion was evoked by the proposition to admit members of the then so-called Marine Hospital Service. Today one can speak frankly of these events; then they were open to controversy and with no little bitterness of feeling. We may now look upon them in the light of ancient family feuds with no other significance than that the organization was, in its very beginning, groping and struggling for development. One conclusion, however, comes to us, and it is that the Association had its birth in the mind of General Senn, a man conspicuous for this as well as other marked achievements, and also that the Association had its first tangible expression among the medical gentlemen of the National Guard.

In the early years, officers of the Association were elected from different services represented in its membership at the will of the organization. Toward the close of the first decade, a rule was adopted whereby the officers were elected from the different services by rotation, thus insuring an even distribution of the honors. This has been adhered tc in almost every instance.

The meetings were held regularly with but two omissions. The first omission occurred in 1898, the year of the Spanish-American War. In that year the membership was relatively small and the urgent need for medical officers so great that sufficient members were not at leisure to meet and carry out the usual program. And again, in 1916, the mobilization of troops on the Mexican border made a meeting of the Association impracticable. Efforts were made to hold a meeting at some one of the encampments in that region, but the dissemination of these over a large territory, their remoteness from centers of activity and the preoccupation of the members in connection with their particular duties to the Government forbade its realization.

By an Act of Congress dated January 30, 1903, the organization was

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duly incorporated. The names of thirty-one members appear in this document. Some of these have been "gathered to their fathers." Some remain to cheer and guide us with their loyal effort and wise counsel.

The purpose of the Association, as defined in the act of incorporation, is as follows: ". . . a body corporate and politic in the District of Columbia, by the name of the Association of Military Surgeons of the United States for the purpose of advancing the knowledge of military surgery, medicine and sanitation in the medical departments of the Army, Navy and the Marine Hospital Service of the United States and of the militia of the different states and to increase the efficiency of the different services by mutual association and the consideration of matters pertaining to the medico-military service of the United States in peace and war."

One significant and wise feature of this enactment is the provision that the Secretary of the Navy, the Secretary of War, the Secretary of the Treasury and the Surgeon General of the Army, the Surgeon General of the Navy, the Surgeon General of the Marine Hospital Service shall be ex-officio members of the Association and, with the president of the Association, shall act as an advisory board.

The constitution of the Association assumed basic form in 1893. Many changes have been made since then to meet new conditions, and more are now urgently needed to meet the requirements of the Association in its rapid growth and to meet the new conditions constantly arising in connection with the times.

The Association began the publication of its proceedings from its first organization. It originally took the form of an annual volume. The long interval between the periods of its publication detracted much from the interest it was desired to arouse. It is doubtful whether these early issues were read by anyone other than the members, and one can suspect that the members who read them were limited to the contributors of the articles themselves. Aside from what merit the subject-matter possessed, these early volumes now serve as valuable and interesting historic records of the Association.

Before the Association had attained its tenth year, its publication was issued monthly and constituted two volumes annually, commencing with January and July. It was first called the *Journal of the Association of Military Surgeons of the United States.* Within the past four years, it has been known as the *Military Surgeon.* The journal is not only a historic display, but is an exponent of the evolution and development of the Association, varied in its aspects, rising and falling with its successes and discouragements. It stands for what we have been. Its contents, good, indifferent and bad, stand as mile-stones along the journey we have made in the struggle to attain what General Senn defined as the purpose of our being. They are no worse, perhaps, than other contemporary medical literature. We were groping along

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untried paths. There were no precedents and limited inspiration. The national policy, involving a peace-loving temperament and an abhorrence of war for any reason, put military spirit in abeyance, and we had no audience except as each of us gave it to the others. Consequently there was much repetition in our printed utterances, much dallying with the elementary theories found in stale works on sanitation, much seeking after ends that were dim, dark and undefinable. How could we write about war when war seemed the remotest kind of a possibility? We dealt more with rhetoric than fact and with gnesses rather than scientific accuracy. The Civil War, to most of us an ancient thought, gave us but few suggestions. The Spanish-American War was so evanescent an incident that we were scarcely in it before we were out of it and much befuddled with regret and chagrin because we had not been wise to foresee what had happened. The Russo-Japanese War was an eye-opener, and we began to sit up and take notice. Our horizon widened.

In whatever successes the Association obtained in its first twenty-three years, there seemed a lack of coherence, coöperation, and stability, and adverse circumstances were quickly felt.

In 1912, the annual meeting at Baltimore was well attended, important and interesting papers were read and discussed and, on the whole, made a healthy display. The following year the annual meeting was held in Denver, a point so distant from the centers where medical officers congregate that the attendance was small and the gathering lacked enthusiasm. Efforts were made to remedy the lethargy that followed. The meeting in Washington of 1915 was only better in a small degree. But this meeting had a good effect. Some of the members, recognizing the need of revivifying influences, set forces to bring this about. Modifications in the constitution were effected. A complete reorganization of the journal and management was accomplished. Successful efforts to stimulate an interest and increase the membership were made. No meeting was held in 1916, for reasons noted above. With the present war looming up as a possibility and the all-pervading desire to be prepared, the Association fell into line and began to prosper with leaps and bounds, parelleling the activities in all the branches of the public services its members represented.

The Association can now be regarded as an organization representing an idea or an impulse peculiar to itself. Composed of medical officers of the Army, Navy, Public Health Service and National Guard, it necessarily is an exponent of what these services represent. The relations between these services and the Association are reciprocal. What the various services are must be reflected in the character of the display made by the Association. And the aims of the Association tend to develop qualities that find their expression in the various services. In time of peace, the Association stands as a potent agent

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in promoting desirable qualities of the medico-military profession. In time of war, the services are paramount in influence and reflect their glory in the body of the Association. And thus today the conditions of war, attended by the amazing developments effected by world changes, have brought us to a point where the view as entertained by General Senn in his inaugural address has not only been realized, but has even been surpassed. War, and the unlooked-for activities of the nation in its prosecution and the prospect of a successful issue of that war as waged against our common enemy, have brought the Association into a prominence that is commensurate with the medico-military activities of the government services. It has attained a success beyond our most sanguine hopes. Our membership now numbers approximately 7,000, nearly doubled since our last annual meeting. The question of properly handling our finances has become so important that it is a department in itself and demands the most careful consideration. The journal is a factor in periodic literature, dignified in its presentation, widely read, and often quoted. The impulse in our organization awakens us to a sense of duty not heretofore felt. We recognize a great obligation which success puts upon us and, seeing this duty, we must pause to determine how we can best meet and discharge it. Past experience will help to direct us. Knowing that which pertains to the present, we have a foothold from which to advance. We must strive, after the manner of the great Senn, and make a forecast of the future, endeavoring to attain to some degree an outlook of what our tasks are to be.

As modifications of what our present organization covers, the following may be suggested:

Those officers elected to be in immediate charge of the affairs of the Association should be men conspicuous for their abilities in that direction. They should be, in addition, men with sufficient time at their command and a genuine inclination to give their undivided attention to the performance of the tasks for which they are selected. They should be favorably located conveniently to discharge these duties. They should be placed under some formal obligation which they cannot easily put aside. They should be suitably compensated.

There should be created a new office known as the business manager. The name implies what the duties of that office will include. Such an office will relieve the editor and assistant editor of much important labor that now burdens them, and to whom it does not properly belong.

The suggestion of General Senn, made in the Association's early existence, that chapters or local suborganizations be established, is worthy of careful consideration. It would cover some of the great needs now apparent to maintain a more vigorous existence. These would help to maintain an interest that often lags because of a widely

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scattered membership, and the promotion of healthy rivalry by factional activities. The annual meetings should be made a composite of the doings of these.

There should be secured the sympathetic support of men holding exalted positions in the government service. Those named in the act of incorporation as an advisory board should come to be more than a name. The patriotic factor and the intimate relationship which the Association has to the government services make this desirable and urgent.

It goes without saying that the Association will persist, originating what it can within its own limits, but taking its greatest inspiration from the Army, Navy, Public Health Service and National Guard and the needs of the nation as interpreted by these. Preparedness, about which we have come to know a great deal, will always be a subject for the most careful consideration. The questions involved in the prosecution of a war as they affect our profession will likewise give us great concern. But preparedness for war and the prosecution of war to a successful conclusion have been so well planned and so far advanced that we can almost regard them as fully and completely realized, and there then comes the third problem which presents itself and which it will be our duty as medico-military agents to help solve. That problem is the preparedness for victory.

To the average mind, the successful conclusion of a war means the end of all trouble, that we can then sit down, calmly fold our hands, and peacefully sit in indolence. This is only the end of the second stage of our great task. Preparedness is the initial effort; war, the climax; victory imposes the labor of the great readjustment, the correction of confusion and the restoration of the earth and mankind to the normal conditions of peace. There have been famous works written on preparedness for war. I am not aware that anything has been written on preparedness for victory. It remains for some one of wide experience and scholarly attainments to deal with such a subject.

With the achievement of victory there naturally follows, along with other events, the subsidence of military activities. Troops are sent home, disbanded, and the men comprising them restored to their peaceful avocations.

Men who have been maimed by war injuries must be generously cared for, their injuries corrected, and educational training made to do what the science of medicine and surgery, as ordinarily applied, cannot accomplish. Many, because of the infirmities of war, will have to readjust themselves to such a degree that new occupations will have to be learned.

Further tasks require us to take up such procedures as the suppression of diseases among the forces and the prevention of their dis-

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semination among the civilian population. The venereal menace will again require our most careful consideration.

There also follows a need that the theater of war be placed in the care of the sanitarian in order that the battle zones may be cleaned and again made habitable for mankind.

The question of the maintenance of population by encouraging marriages and increasing the birth rate is of great moment and should be a subject for study by our profession, and its recommendations embodied in legislative enactments.

The great lessons learned by our profession in the war are to be studied, discussed and published in order that permanent records may be made for future guidance. Thus will arise a medical literature of the war.

There is great need for a study of the conditions that will promote the welfare of our own profession. Disease and injury have made and will make great inroads on our numbers. This must be met by making the profession attractive and thus encouraging young men to follow it as a life career.

War has enlightened us as to the employment of the necessities of life and their economic value. Our views as to food, raiment and shelter have already been markedly modified. This, too, opens up a wide field for the specialist. And what a world of possibilities for the betterment of mankind lies therein!

The psychology of a nation in the exaltation of victory is to be considered by our profession. With the attainment of victory, there is apt to be a period of relaxation. Tension is lessened. Inhibition wanes. The composure forced by a keen desire to attain victory vanishes and peoples become emotional. There is a state of views akin to that which we attribute to the gentler sex, brave in moments of danger, but, the danger past, they wax hysterical. In the history of the world, the conclusion of nearly all wars has brought about such displays. This is a question concerning both the victor and the enemy conquered, and our profession as military surgeons has here another field in which to anticipate and prepare for great work.

So these are some of the problems of the future which we can now see with partial clearness. More will become apparent as time goes on. It is for us to study them, both as officers of a great nation and as part of an association to be members of which it gives us pleasure.

Somehow, oratory in these days is out of date. An attempt at eloquence is needless. Rhetorical phrasing is superfluous. Even words sparingly used poorly help to convey the great thought in our mind and the profound emotion in our heart. Whether we go back to restudy preparedness, whether we analyze those features of actual warfare that concern us, or whether we peer into the future and endeavor to meet the problems presented by victory, may we as an association be forever inspired by the one impulse—Carry on!

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Following the president's address, a paper on "Military Emergency Ophthalmic Surgery and Practice" was read by Lieut. Col. George E. de Schweinitz, M. C., U. S. Army, which, with other professional papers presented to the meeting, will appear in future issues of THE MILITARY SURGEON.

After Lieutenant Colonel de Schweinitz's address a paper on "A Summary of the Activities and Problems of Otolaryngology" was presented by Col. H. P. Mosher, M. C., U. S. Army.

Upon completion of Colonel Mosher's address, a paper entitled "Naval Transportation of Army Sick and Wounded Overseas," by Capt. J. A. Murphy, M. C., U. S. Navy, was read by Capt. F. E. McCullough, M. C., U. S. Navy, Captain Murphy being absent.

The first session was closed with an interesting address by Lieut. Comdr. W. S. Bainbridge, M. C., U. S. Navy, on "The Spirit Behind the Lines."

The second session at 1 p. m. was devoted to demonstrations at the Sanitary Museum, in charge of Lieut. Col. C. S. Williamson, M. C., U. S. Army, and the third session at 3 p. m. included surgical clinics and visits to the special schools at Camp Greenleaf. A meeting of the Executive Council was held at headquarters at 3.45 p. m.

At the fourth session at 7 p. m., held in the Open Air Auditorium, the following illustrated lectures were presented:

1. "Restoration of Bone Loss from Gunshot Injuries," Major F. H. Albee, M. C., U. S. Army.
2. "Sanitation in Camps and Hospitals on the British Front in France," Capt. F. S. Pleadwell, M. C., U. S. Navy.
3. "Some Practical Lessons in the Care and Treatment of the Mutilated from the Experiences of our Allies," Lieut. Comdr. W. S. Bainbridge, M. C., U. S. Navy.

The fifth session at 9 a. m., October 15, was divided into two meetings, one at the Camp Greenleaf Auditorium, where the following subjects were discussed:

1. "Hemorrhoids, from the Military Standpoint," Lieut. J. C. Mobley, M. C., U. S. Army.
2. "The Soldier's Hernia," Lieut. J. F. Spearman, M. C., U. S. A.
3. "The Surgical Bearing of the Triple Vaccines," Lieut. Col. Edward Martin, M. C., U. S. Army, and Capt. John A. White, M. C., U. S. Army.
4. "A Study of Hand Disinfection," Lieut. C. S. Hays, M. C., U. S. Army.
5. "The Prevention of Post-Anesthetic Pulmonary Conditions," Capt. O. N. Warren, M. C., U. S. Army.

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6. "Ether Analgesia," Capt. O. N. Warren, M. C., U. S. Army.

7. "The Bradford Frame as a Hospital Bed," Capt. W. E. Lee, M. C., U. S. Army.

8. "Technique of the Bacterial Control of Wounds," Capt. W. H. Furness, M. C., U. S. Army.

The second meeting was held at the Medical Section Open Air Auditorium, this meeting being called by President Lung, who named the following committees:

NOMINATING COMMITTEE: Col. William N. Bispham, M. C., U. S. Army; Capt. F. E. McCullough, M. C., U. S. Navy; Maj. J. B. I. Brown, M. C., U. S. Army; Dr. C. P. Knight, U. S. P. H. S.

RESOLUTIONS COMMITTEE: Capt. F. L. Pleadwell, M. C., U. S. Navy; Lieut. Col. G. E. de Schweinitz, M. C., U. S. Army; Lieut. Commander William Seaman Bainbridge, M. C., U. S. Navy.

AUDITING COMMITTEE: Col. Roger Brooke, M. C., U. S. Army; Lieut. Col. W. H. Richardson, M. C., U. S. Army; Lieut. S. B. Burk, M. C., U. S. N. R. F.

Col. Louis A. La Garde, M. C., U. S. Army, Secretary-Editor *ad interim*, then made the following report of the Secretary-Editor.

Mr. President, and Members of the Association of Military Surgeons of the United States:

I have the honor to render herewith a report of the activities of the office of Secretary-Editor of this Association for the period from October 7, 1917, the date of our last meeting, to the present date. In view of the fact that the Acting Secretary-Editor has also functioned as treasurer *ad interim* since February 19, 1918, I shall not burden you with a long report covering the office of Secretary-Editor.

I am happy to state that the report now rendered is one of continued progress, and there is no reason to apprehend any falling off from the present prosperity enjoyed by the Association. In fact, viewing the past year's work as a foundation upon which still greater accomplishments may be built, we can safely face the future, believing that we are destined to still greater growth.

The campaign for new members has been extensive, and is continuing. This work is costly in time, effort and money, but it certainly pays, as is evidenced by the increase in our membership. Our present membership is:

Army	5,771
Navy	390
U. S. P. H. S.	126
National Guard	508
Honorary	52
Total	6,847

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Our membership October 7, 1917, was:

Army	3,458
Navy	174
U. S. P. H. S.	133
National Guard	558
Honorary	61
Total	4,384
Increase in membership for the year	2,463

The Secretary wishes to express his thanks and appreciation to the officers in the various camps for the most excellent work they have done towards increasing the membership of the Association.

The work of the secretary's office from the date of our last annual report to August 3, 1918, was conducted by Col. John Van R. Hoff, U. S. Army, Retired, in a most efficient and faithful manner. To him and his predecessor, Col. E. L. Munson, we are indeed indebted for their efforts in bringing about the prosperous condition of the Association as it exists today.

It was found that money was being lost through our former advertising policy. This question was carefully considered and, upon recommendation of the Executive Council, an advertising agent was employed. We believe this was the right step in the proper direction. As a matter of fact, we are already realizing the fruits of such a venture.

Our growth in a financial way has been most excellent. At our last meeting we reported a surplus of $13,338.07; we now have $21,912.75 against which the treasurer reports there are no bills. Of this sum $19,000 has been turned over to the Sinking Fund Committee and invested in Liberty Bonds of the third and fourth issues.

We need not say that our mailing list has developed to large proportions. This is evidence of a vitality which is bound to make The Association of Military Surgeons of the United States the great medico-military society of the world.

With a membership ever on the move such as ours, there are many changes in addresses necessitated each month. The work entailed in effecting these changes and the possibility of error are great, but they may be lightened somewhat if the members will do their part. The secretary cannot know the new addresses until informed of them, and the printer cannot make the many changes in the mailing list now demanded unless he is given reasonable time therefor. It is therefore urged that the secretary be informed promptly of all changes of address, and that failure to receive the journal monthly be promptly reported to our office.

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On motion, duly seconded, the report of the Secretary-Editor was accepted.

Colonel La Garde then presented the following report of the Treasurer *ad interim,* and, on motion duly seconded, the report as read was accepted.

Mr. President and Members of the Association of Military Surgeons of the United States:

I have the honor to submit the following report for the period since our last annual meeting to date. I am happy to state that our finances are the best in the history of the Association.

The office of treasurer has changed hands three times during the past year. Surgeon W. C. Rucker, U. S. P. H. S., on being ordered overseas, at the direction of the Executive Council, turned over the funds, aggregating $13,749.17 to Col. J. Van R. Hoff, M. C., U. S. A., Retired, who had been elected treasurer *ad interim.*

Receipts during Dr. Rucker's incumbency	$13,130.29
On hand October 7, 1917	13,338.07
Total	$26,468.36
Disbursed October 7, 1917, to February 19, 1918	12,719.19
Balance as transferred to Colonel Hoff by Dr. Rucker	$13,749.17

The receipts and disbursements February 19, 1918, to October 1, 1918, have been as follows:

Receipts

Admission fees	$8,466.20
Annual dues	7,538.65
Subscriptions	1,562.09
Advertising	4,596.78
Miscellaneous, including sale of reprints to S. G. O., War Department, and sale of insignia of the Association	1,786.66
	$23,950.38
Cash balance February 19, 1918, in National Bank of Washington	2,802.39
Making a total of	$26,752.77
Less disbursements as itemized below	24,512.11
Leaving a balance in the National Bank of Washington, October 1, 1918, of	$2,240.66

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Disbursements

February 19, 1918, to October 1, 1918

Printing journal	$11,800.97
Salaries and commissions	1,391.67
Advertising	40.00
Postage	1,135.00
Stationery and printing	1,057.55
Cost of reprints	1,370.60
Telephone	26.80
Miscellaneous	438.69
	$17,261.28
Transferred to investment account	7,250.83
Total	$24,512.11

Investment Account

February 19, 1918:	
Cash on deposit	$13,749.17
April 30, 1918:	
Withdrawn from cash account	3,250.83
July 1, 1918:	
Interest	34.53
October 1, 1918:	
Purchase of Fourth Liberty Loan Bonds	4,000.00
Total	$21,034.53

Assets

Third Liberty 4¼ per cent bonds	$15,000.00
Fourth Liberty 4¼ per cent bonds	4,000.00
Deposit, American Security and Trust Company	1,006.64
Deposit, Union Trust Company	1,027.89
Total, October 1, 1918	$21,034.53

There is a balance on the current account (National Bank of Washington) not included in the above report of $878.22, which makes the total wealth of the Association, October 12, 1918, $21,912.75, against which there are no bills whatever.

In conclusion, your treasurer wishes to state that all subscriptions are being stopped promptly upon expiration, the journals being held in the office until the dues are paid, when all back numbers are mailed. This policy was impossible previous to the affairs of the secretary's and treasurer's office being conducted in one and the same office.

LOUIS A. LA GARDE,
Treasurer ad interim.

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The business session was closed with a report of the Committee on Necrology, presented by Maj. S. C. Stanton, M. C., U. S. Army. This report was received standing and ordered filed.

The literary program was then taken up, with Col. Louis A. La Garde in the chair. The following papers were read and discussed:

1. "The Acute Ear Complications of Measles," Maj. T. J. Harris, M. C., U. S. A.

2. "Pulmonary Complications of Measles," Maj. N. B. Foster, M. C., U. S. A.

3. "Unusual Reactions Following the Administration of Typhoid-Para-typhoid Vaccines," Maj. N. B. Foster, M. C., U. S. A.

4. "Typhoid Fever, Vaccine, Incidence and Problem of, at Chickamauga Park," Maj. R. A. Keilty, M. C., U. S. A.

5. "The Extra-Cantonment Problem at Chickamauga Park," Dr. C. P. Knight, U. S. P. H. S.

Due to the absence of Major Keilty, his paper was read by title.

The meeting then adjourned until 2 p. m.

The sixth and seventh sessions, at 2 and 3 p. m., respectively, were devoted to a review at Kelley Field, followed by a tour of Chickamauga Park. Fully 5,000 people witnessed the 20,000 medical officers and sanitary troops pass in review. The review was great—every man in his place and everything done just as planned.

At the eighth session, held in the Y. M. C. A. Auditorium, the entire program was given by the Greenleaf Talent Company, Maj. W. N. McKenzie, M. C., U. S. A., chairman. The program was well selected and was thoroughly enjoyed by all present.

The ninth session at 9 a. m., October 16, was also a double meeting, the surgical section being at Camp Greenleaf Auditorium and the medical section in the Open Air Auditorium. At the former meeting the following subjects were discussed:

1. "Demonstration of Standard Army Splints," Capt. J. T. O'Ferrall, M. C., U. S. A.

2. "Importance of Minor Foot Ailments and Military Footgear in the Army," Capt. W. J. Merrill, M. C., U. S. A.

3. "The Roentgenologist Overseas; Liaison Between the Surgeon and Roentgenologist," Lieut. C. A. Waters, M. C., U. S. A.

4. "The Hirtz Compass Method of Localization" (with demonstration), Capt. E. S. Blaine, M. C., U. S. A.

5. "The Training of the Military Roentgenologist," Lieut. Col. W. F. Manges, M. C., U. S. A.

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At the medical section, papers in the order shown were presented:

1. "Simulation of Pulmonary Tuberculosis by Uncinariasis," Maj. R. D. Adams, M. C., U. S. A.

2. "Oral Hygiene and Focal Infections," Maj. H. B. Butler, M. C., U. S. A.

3. "Gas Defense Training," Maj. T. B. Appel, M. C., U. S. A.

4. "Cutaneous Affections of War," Maj. W. F. McBride, M. C., U. S. A.

5. "Bacteriology of the Present Epidemic of Influenza at Chickamauga Park," Maj. D. H. Bergey, M. C., U. S. A.

6. "The Training of the Urologist for the Military Service," Maj. G. Timberlake, M. C., U. S. A.

The final business session was held at the Camp Greenleaf Auditorium at 1 p. m.

Under the Board of Award, President Lung stated that, due to the fact that the Board of Review for the Wellcome Prize contest had not arrived at a decision, no award could be made at the meeting.

The amendments to the Constitution and By-laws were next considered. The following changes and additions were adopted, these having been proposed at the 1917 annual meeting:

Add to Section 4, Article IV:

A Sinking Fund Committee to consist of the president, who shall be chairman, the treasurer, who shall act as secretary and custodian of the fund, and three members to be elected from the former presidents of the Association, the latter to hold office for three years. Those first elected shall select by lot who shall go out at the end of the first, second and third year, respectively, and each year thereafter one member shall be elected to the committee at the annual meeting of the Association. Vacancies occurring in the interval may be temporarily filled by the committee.

Add to Constitution:

ARTICLE VIII.—*Sinking Fund*

Such funds belonging to the Association as are not needed in current requirements shall be placed in the hands of a committee to be known as the Sinking Fund Committee. The Sinking Fund shall be invested in Government or other bonds approved by the committee, or deposited in an approved trust company until so invested, and no money shall be withdrawn from this fund except upon a majority vote of the Sinking Fund Committee and of the Executive Council voting

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separately in session or by letter. When withdrawal is thus approved, it shall be made by an order on the treasurer signed by the president of the Association. The custodian (treasurer) of the fund shall be bonded in such sum as the committee shall determine, and his accounts, and the securities and funds shall be audited annually and at such other times as the committee requires.

Add to Article II of the By-laws, Expulsion from Membership: "Or who may be guilty of such conduct though then not a member of the service."

Add to Article IV of the By-laws, last sentence of Section 1: "This shall include subscription to THE MILITARY SURGEON for one year.

Add to Article IV of the By-laws, Section 2, Annual Dues, last sentence: "Provided that in the case of members who have resigned or have been dropped for non-payment of dues under Section 2 of this article, such members may be readmitted without payment of a second entrance fee and upon payment of delinquent dues." Also change the annual dues from two dollars to one dollar.

Article IV of the By-laws, Section 4, Official Journal: Change the subscription to members to read "three dollars" instead of "two dollars," and add the following: "Payable in advance, and the journal shall be stopped on expiration of unrenewed subscription."

Article VI, Section 3—The Secretary: "The minutes of the meeting" to be added in the first line. Also add as a fourth paragraph of the same article and section: "He shall be editor of the official journal."

Article VI, Section 4—The Treasurer: Add at end of first paragraph the words: "Except as provided in Article X," and continue the first sentence, second paragraph, to read: "and at such other times as the Executive Council shall require." Also as a fourth paragraph: "He shall be custodian of the Sinking Fund."

Article VII, Section 1, add as a last sentence under "duties of the Executive Council" the following sentence: "It shall temporarily fill all vacancies occurring among the officers of the Association between annual meetings."

Article VII, Section 2, add the following sentence under "Conduct of Business": "The secretary shall keep a record of such correspondence and of the minutes of the meetings of the Council."

Article VII, Section 4, "Quorum"—In the first line add the words, "in Meeting" between "Council" and "shall," and as a last sentence: "In correspondence a majority of the whole Council shall govern."

Articles X, XI, and XII were added to the By-laws, as follows:

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ARTICLE X.—*The Journal of the Association*

The Association shall publish a monthly journal to be known as THE MILITARY SURGEON, in which shall be printed the proceedings of the annual meeting and such other matter as is determined upon by proper authorities. The cost of the journal shall be paid by an allotment of Association funds to be made on a budget submitted by the editor and approved by the Executive Council.

The Secretary shall be ex-officio editor of the journal and may appoint, with the approval of the Executive Council, such associate editors and collaborators as he finds necessary or desirable in conducting its publication.

He shall receive such monies accruing from subscribers, advertisers, and other sources pertaining to the journal as are sent to him, shall keep a business record of the same and deposit the money in a bank approved by the Executive Council, in the name of The Association of Military Surgeons of the United States, subject to his order.

He shall pay such bills as are due in connection with the journal, which have been approved by the president, or an officer of the Association designated by him, and shall render a monthly account through the president to the treasurer with his check for any unexpended balance remaining to his account at the end of each month.

The editor shall be bonded in amount determined by the Executive Council and shall submit a report at the annual meeting of the Association, with a statement of his account duly audited by a certified accountant, to be designated by the Executive Council, and such other reports as may be called for by the Council.

ARTICLE XI.—*Amendments*

All proposed amendments to these by-laws must be forwarded to the secretary, who will present them to the Executive Council at least three months before the next annual meeting. The proposd amendments and views of the Council shall be published in the journal of the Association not later than one month before the annual meeting, at which meeting they may be adopted by a three-fourths vote of all the members present.

ARTICLE XII.—*Order of Business*

1. Reading of records of previous meeting.
2. Appointment of Committees.
3. Report of Executive Council.
4. Report of Secretary.
5. Report of Treasurer.
6. Report of Editor.
7. Report of Standing Committees.
8. Report of Special Committees.

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9. Unfinished Business.
10. New Business.
11. Literary and Social Program.
12. Election of Officers.
13. Installation of New Officers.
14. Reports of Committees.
15. Incidental Business.
16. Adjournment.

The parliamentary rules governing in the Congress of the United States shall be the standard of this Association.

Following this, the Nominating Committee presented its report, submitting the following names:

President: Col. Henry P. Birmingham, M. C., U. S. A., Ret.
First Vice-President: Col. Joseph A. Hall, M. C., U. S. A.
Second Vice-President: Asst. Surg. Gen. J. W. Kerr, U. S. P. H. S.
Third Vice-President: Capt. Frank L. Pleadwell, M. C., U. S. N.
Secretary: Col. W. J. L. Lyster, M. C., U. S. A.
Treasurer: Col. W. J. L. Lyster, M. C., U. S. A.
Sinking Fund Committee: Surg. Gen. Rupert Blue, U. S. P. H. S.; Surg. Gen. William C. Braisted, U. S. N.; Col. John Van R. Hoff, M. C., U. S. A., Ret.

The report was accepted and the secretary directed to cast a ballot for the nominees, after which the President declared them duly elected.

In presenting the newly elected president, Captain Lung said:

It has been my great privilege to be a member of the Association for nearly fifteen years. Four of these years I have had the honor of being one of its officers, and as such I have endeavored at all times to discharge these duties faithfully. There was a time when the officers felt more the honor than the responsibility. Today the honor is undiminished, but the responsibility is greater. It now comes to a point where the retiring president has the privilege of conferring on himself a new honor, namely, that I am the most recent and youngest ex-president of The Association of Military Surgeons of the United States, and as such I take leave to present to you your newly elected president, Col. Henry P. Birmingham, M. C., U. S. A. Your new president, gentlemen.

Colonel Birmingham, replying, said:

Gentlemen, I can hardly express to you how deeply I feel the great honor that has been conferred upon me. I joined the Association some twenty-five years ago, shortly after it was organized. It was, as most of you know, brought into being through the work of one of the greatest surgeons the United States has ever produced—Gen. Nicholas Senn—

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who took the young organization and by the force of his personality kept it upon its feet. It was still a struggling organization as time went on, but destined to be a very responsible organization. It was not, however, until after the start of the present great war that it began to take its place in the scientific world. I feel that all of you have come into the Association, not only for the good of the Association, but for the good of the service, because they are largely identical. You can rest assured that I will do my very best to further the interests of the Association.

Col. Louis A. La Garde, M. C., U. S. A., addressing the chair, stated that on previous occasions the Association had conferred honorary membership on foreign visitors and delegates, and that the Executive Council had elected the following named honorary members: Col. C. K. Morgan, R. A. M. C.; Maj. M. Serrati, Royal Italian Navy; Surgeon Candiotti (A. C.), French Cruiser Force.

The Resolution Committee presented the following, amending the Constitution:

Whereas actual experience has demonstrated the very intimate business relationship between the offices of secretary-editor and treasurer of the Association, without which coördination is most difficult and errors in accounts and addresses very frequent, all resulting in dissatisfaction to and criticism by the membership; therefore, be it

Resolved, That Section 2, Article IV, of the Constitution be amended by eliminating the words "and a" between the words secretary and treasurer, in the fourth line, and substituting a hyphen combining the two offices in one. And in all articles of the Constitution and By-Laws where duties are prescribed for secretary or treasurer, the designation secretary-treasurer shall be substituted therein.

This will have to be held over for one year and be acted upon at the next annual meeting.

A motion by Lieut. S. B. Burke, M. C., U. S. N. R. F., that "The Association subscribe a suitable vote of thanks to Col. Wm. N. Bispham, M. C., U. S. Army, and his committee for the excellent program they prepared and the wonderful entertainment tendered the visitors," was duly seconded and unanimously carried.

President Birmingham stated that it was customary to select the place and time for the next meeting of the Association at the last session, but due to the fact that the times and conditions are so uncertain, he thought it would be advisable to defer such action. A motion by Maj. S. C. Stanton, M. C., U. S. A., that the selection of the time and place of the next meeting be left with the Executive Council was adopted.

On motion, the meeting then adjourned *sine die.*

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A meeting of the Executive Council was held at the call of the president at Washington, November 8, 1918.

Col. W. J. L. Lyster, M. C., U. S. A., who was elected secretary and treasurer of The Association at the annual meeting, October 14-16, was unable to accept these offices due to the exigencies of the service. The Council elected Col. J. Robb Church, M. C., U. S. A., Ret., to fill these vacancies.

The Council directed that the Act of Incorporation and the Constitution and By-laws of The Association be printed in the journal, and the same will be found elsewhere in this number.

The following 657 officers, having complied with the requirements of admission, were duly elected to membership in The Association of Military Surgeons of the U. S.:

Medical Corps, U. S. Army
Majors

Leonard W. Bacon
Thomas B. Carroll
Claude C. Coleman
Robert J. Graves
Gavin Hamilton
Norman M. Heggie
Samuel R. Hopkins
Robert C. Howe
William H. Marshall
George E. McPherson
Howard McI. Morton
Charles Reed Pollard
Hunter Robb

Medical Corps, U. S. Army
Captains

Edward Adams
Jesse F. Adams
Charles A. Albrecht
Hugh H. Alldridge
Olney A. Ambrose
James A. Ames
George M. Anderson
Neil Andrews
George W. Anglin
Arthur S. Armstrong
Lloyd R. Atkins
John L. Avey

Captains—Continued

Gilbert H. Ayling
Jay H. Bacon
William P. Baker
Norman C. Baker
L. B. Baldwin
Lindsay A. Beaton
Arthur E. Benjamin
Richard S. Benner
Charles W. Bertram
Louis C. Bleick
Robley D. Blount
Charles P. Bolles
E. R. Bondy
Albert E. Booth
Marvin A. Bowers
Charles E. Brain
John D. Brewer
John A. Brooke
Thomas S. Brown
John R. Brownell
William C. Bryant
Thomas D. Buchanan
G. W. Burner
Carroll C. Burpee
Clarence H. Burr
Charles A. Burritt
Edward W. Burt
Douglas G. Campbell
Walter L. Campbell
Harry B. Carpenter
William H. Carter

Captains—Continued

John H. Cary
Lester B. Cavins
Albert M. Chambers
Harry C. Cheney
J. W. Cheney
Jacob G. Chidester
O. W. Clabaugh
Manford M. Clapper
George F. Clark
Frank R. Clark
Edward C. Clavin
John W. Cole
P. F. Cole
Charles H. Colgate
Alfred E. Comstock
Charles P. Cook
William L. Cooke
William F. Cope
Curtis B. Cotton
Earl G. Coverdale
James H. Crawford
Julius Crisler
George R. Critchlow
Ernest M. Currie
William G. Curtis
Andrew T. Custer
Roscoe C. Danford
William S. Darling
George L. Davenport
Warren B. Davis
Jesse S. DeMuth

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Captains—Continued

Louis A. Denis
Alphonse De Pierre
John P. De Witt
Warren L. Diller
Carl E. Dudley
Charles B. Dugan
Charles M. Du Puy
John H. Edmonson
Stephen A. Edwards
Daniel N. Eisendrath
E. L. Erhard
Rich L. Ertzman
William G. Eyman
William D. Farrell
Jacob W. Farrow
Emerson W. Fisher
Otto H. Foerster
F. D. Frizzell
Isaac T. Fugate
James H. Fulbright
Ralsa M. Fuller
Allen G. Fuller
James R. Garner
Horatio W. Gass
John M. Gelwix
Jules F. X. Gendron
William E. Gernbard
Henry Getty
John M. F. Gill
Henry W. Gissell
A. H. Gladden
Tib N. Goff
J. Matt Gordon
M. G. Goring
Frederick L. Gourley
Albert G. Gumm
Charles E. Habintel
John J. Harrington
R. C. Harris
Charles H. Harris
H. W. Harris
Walter F. Hartman
Francis M. Hartsook
Francis R. Haussling
Benjamin H. Hawkins
Theodore C. Hays
Willie H. Hendricks

Captains—Continued

F. P. Herff
Robert E. Hevens
Joseph H. Hiden
Edward T. Higgins
F. W. Hinkle
Silas M. Hohf
J. H. Hohnstedt
Henry V. Holcomb
Geo. W. Holden
James E. P. Holland
George A. Holliday
Eugene Holloway
E. M. Hoover
James A. S. Howell
Harry V. Hubbard
Joseph M. Huber
Harry D. Hull
Joseph H. Humphrey
Wilson E. Hunt
Howard B. Jackson
Harry Jackson
Alanson H. Jones
Fred W. Jones
Clement L. Jones
Robert L. Johnson
Gustaf H. Johnson
Josiah Z. Johnson
Edward S. Johnston
Arthur E. Joslyn
Henry M. Joy
Albert F. Kaeser
M. J. Kern
Kent V. Kibbie
John R. Kight
Geo. A. Kilpatrick
Walter L. Kitchens
James A. Knox
B. O. Kreilick
Herman L. Kretschmer
Fred H. Kuegle
Joseph R. Kuth
Thomas B. Lacey
P. Edward Larkin
William A. LaRoss
Carl J. Larson
Clarence J. Latta
Edward L. Leonard

Captains—Continued

Orville G. Lewis
Simon E. Lincoln
William Lindsay
Walter M. Lippincott
Frank B. Livermore
Aljah W. Lloyd
Jacob Long
Henry C. Luck
William N. Lynn
John MacLachlan
Harry F. MacLeod
John MacNamara
William J. Malloy
Alexandre J. Mange
R. M. Manley
David A. Mann
David L. Martin
David P. Mayhew
James R. McCracken
Arthur M. McElhannon
Thomas J. McGuire
William B. McKenna
Charles D. McKenzie
Patrick J. McLaughlin
Ephraim R. McLean
John B. McMurray
William A. McMurtie
Charles F. McNevin
Walter E. Meanwell
Lester R. Mellor
G. D. Merrill
Hugh R. Miller
Ross H. Miner
Fritz J. Mernnighoff
Matthias J. Moes
Charles M. Montgomery
Eli M. Morehouse
Harold J. Morgan
Alanson F. B. Morris
Frank Morris
W. Bean Moulton
Emil A. Muller
Thomas W. Murphy
George P. Myers
John L. Myers
Charles O. Neff
William Neuss

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Captains—Continued

Louis A. Nelson
Charles F. Nutter
Francis E. O'Brien
David M. Olkon
John Walter Orr
Dudley W. Palmer
Henry L. Parish
Jason S. Parker
Harvey G. Parker
Charles L. Patton
Howard B. Pedigo
Frank P. Petty
Dwight C. Phillips
Franklin A. Pierce
Geo. W. Poovey
William E. Ranz
Grove H. Rathbum
C. H. Van Ravenswaay
Frederick C. Reed
Ralph W. Reed
Charles S. Rehfeldt
Lewis T. Rhoads
H. A. Rice
Alfred L. Ridings
Leander A. Riely
Charles C. Rinard
Clarence B. Ripley
Henry Ritter
David C. Roach
George C. Robert
Frederick M. Robertson
Frank W. Romaine
Maurice I. Rosenthal
Jacob Rosenthal
Jacob W. Royer
W. W. Ryall
John N. Ryan
Roy F. Saunders
William J. Scanlan
James D. Schmied
Henry Scott
Everett W. Shank
Frederick K. Shaw
William A. Shelton
Hargus G. Shelly
Walter C. Shaw
Lewis T. Smead

Captains—Continued

L. L. Smith
Robert A. Smith
John B. Stackable
Arthur H. Stall
Otis O. Stanley
Charles C. Stanton
Frank T. F. Stephenson
Roy P. Stoops
Owen T. Stratton
Eugene A. Sturm
B. R. Sumner
Ernest K. Tanner
Arthur S. Tenner
Francis H. Thibodo
James E. Thompson
James R. Tillotson
John D. Trawick
Clarence S. Trimble
Frank S. Ullom
John L. Valley
G. B. Van Doren
Gustave A. Van Lennep
William L. Van Sant
Walter E. Vest
Granville H. Walker
William H. Walker
John M. Wallace
Henry J. Walton
Harold L. Warwick
Henry G. Weiss
John M. Wheeler
Homer H. Wheeler
Justin V. White
William B. Whittaker
Geo. W. Willard
Thomas J. Williams
Benjamin C. Willis
Frank B. Wilson
Claude T. Wolfe
Harry Wood
William W. Woody
Harry G. Wright
James B. Young
John I. Zerbe

First Lieutenants

J. R. Agnew

First Lieutenants—Contd.

Marshall L. Alling
E. R. Altizer
Harry E. Anderson
W. T. Anderson
S. C. Anthony
Willard B. Ashby
Leslie O. Ashton
Frederick C. Atkinson
G. F. Bainter
Sylvester L. Ballard
V. E. Bantleon
Kenneth R. Barnum
William D. Barry
Thomas H. Bates
Jesse J. Beatty
Emery A. Bechtol
John W. E. A. Beck
Patrick E. Biggins
W. A. Behan
Frank T. Benoit
Malamed B. Bernard
Edgar V. Berry
David L. Bettison
Harold V. Bickmore
E. L. Bishop
Napoleon Bisson
Clough H. Blake
Julius B. Boehm
Thomas B. Bond
Milton R. Bookman
Richard K. Bragonier
C. A. Breitling
Roger W. Brookie
Charles A. Brownson
G. Bedford Brown Jr.
J. F. Brown
Paul L. Bruner
James N. Buchanan
James J. Buckley
Stearns S. Bullen
Harvey C. Bundy
John J. Burne
Harold B. Buterbaugh
Alfred F. Calvelli
Joseph H. Campbell
John D. Carlton
J. B. Cash

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Chester J. Challenger
W. E. Chamberlain
Charles M. Chilton
L. D. Clark
John G. Clem
Bradford F. Clutter
Everett W. Coates
Ernest M. Collier
William M. Collins
Smith A. Combes
Horace P. Conley
James A. Connell
Harry S. Conrad
Roy O. Cooley
Herbert H. Cornforth
Delzon N. Cott
L. B. Cowen
Albert J. Craig
Langdon T. Crane
William S. Crawford
James W. Croft
Robert L. Crum
Wilford H. Crutcher
Harley L. Cunningham
R. W. Dake
Lyle M. Daley
Alfred Daudelin
John I. David
John F. Deal
William J. Delanny
J. B. Deuel
Richard L. Devereux
Andrew C. Dorminy
Charles F. DuBois
L. Dumont
Edward T. Edwards
David H. Edwards
John E. Edwards
Orville L. Edwards
Arthur B. Egan
George W. Elarbie
Sigmund Epstein
Samuel C. Eveleth
Humphrey J. Falvey
Harry B. Fenerstein
Willard J. Fenton
Robert K. Fenley

First Lieutenants—Contd.
George Flamm
Robert C. Flemming
H. H. Fletcher
Woodruff J. Flowees
Herman P. Foehrenbach
R. W. Fonts
Horace J. Forman, Jr.
Edward P. Forrestel
Eli N. Foster
H. C. Frick
Peyton J. Fullingim
Samuel E. Gayman
Frank L. Gibson
William C. Gibson
Harry N. Golding
Robert Goodman
Thomas M. Gordon
Jay-Gould
Clarence B. Greer
Wendell I. Green
Milton E. Gregg
Herman C. Grim
Jesse R. Grimes
S. F. Grubbs
Albert M. Haeffner
Archer C. Hall
Willis H. Hall
John K. Hamilton
Burtis M. Hance
John L. Hankins
Trusten M. Hart
George Hay
Ralph Salem Heilman
Okey C. Henderson
James T. Henley
Edwin B. Henry
H. J. Hensinkveld, Jr.
Louis M. Herskowitz
Robert E. Hilburn
Marshall L. Hillsman
John J. Hilton
Jerome B. Hirsch
James Hodgkiss
William E. Hodgson
Clarence C. Hoke
Otto Holinger
Luther W. Holloway

First Lieutenants—Contd.
Lysander P. Holmes
Barney E. Horton
Otto C. Horst
Earl Huffer
Thomas Hulick
Alexander C. Hunter
William H. Hurley
Allan P. Hyde
Harold V. Hyde
Victor J. Jacobson
Leo J. Jacobson
Wiley W. Johnston
Fred F. Jones
W. P. Jordan
Michael F. Joyns
Victor E. Kaufman
Jacob D. Keifer
Frank C. Keil
Nicholas W. Kelly
Clinton W. Kelly, Jr.
Curtis E. Kelso
Charles C. Kemble
George B. Kent
L. H. Kerr
Donald S. King
Jesse E. King
Richard F. King
J. Lee Kinner
C. W. Kirkland
Theodore M. Kittelson
Patrick J. Kittredge
Frederick H. Kliefoth
N. H. Klein
Diedrich Klemptner
Boyer S. Kofford
James G. Koskland
John K. Kreider
Manfred H. Kudlich
N. B. Kupfer
F. S. Laczynski
Francis H. Lacly
Leo D. Lafarque
Lloyd J. Lanich
Martin L. Larson
Alfred J. Leary
Thomas H. Leggett, Jr.
Ernest C. Lehnert

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Frederick J. Leonard
Joseph B. L'Episcopo
Joseph J. Levy
Perry M. Lewis
Lee A. Lewis
Horace A. Leyden
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Lewis J. Linehan
Harold R. Lipscomb
Zack J. Little
James G. Logre
Anthony H. Longe
W. S. Lorimer
James M. Mac Kellar
Rudal M. Majocwsky
Sigmund Mann
Joseph L. Mara
Abraham A. Margulis
John I. Moris
Roman D. Martinez
Cullen B. Maxson
R. H. Mayhew
George R. McAuliff
Charles L. McCullough
Samuel R.W. McCune
John J. McIntosh
William J. McKenna
Roscoe W. McKinley
John T. McLarney
S. M. McLaughlin
Carl H. Metzger
William H. Mikeseh
Leo C. Miller
Elwood Miller
G. A. Miller
Alex McL. Milligah
Alfred E. Mills
John Mitchell
L. A. Mitchell
Oscar A. Mockridge
H. Watson Moffitt
David H. Moore
Horace C. Montgomery
Frank L. Morrow
Elmer W. Mosley
Everett C. Moulton
John H. Muller

First Lieutenants—Contd.

Ira Mullins
Chauncy P. Munsell
William J. Murphy
Edward C. Murray
Stanley Naikelis
O. Clyde Nevill
Clarence B. Norcross
Edward A. North
Edward Novak
James A. Oliver
Walter W. Oliver
Clyde Overton
Ritchie C. Ovens
John M. Page
R. W. S. Pegram
Harry J. Perlberg
David A. Perrin
Thomas E. Phillips
Leland E. Phipps
Britton E. Pickett
Alfred B. Pickering
Sewell N. Pilchard
Lawrence P. Piper
Everett L. Pirkey
S. M. Pittman
D. G. Plumb
Carlton F. Potter
I. E. Pratt
Earl W. Presley
William H. Price
Hugh W. Priddy
Thomas M. Proctor
Claudinus E. Quinn
Moses Raskin
Ritz C. Ray
W. F. Reardon
Norman L. Reynolds
Charles W. Rice
Charles A. Roork
Edward N. Roberts
Linford B. Roberts
A. V. Rockwell
John B. Roe
Harry L. Rogers
Platt H. Rogers
Leopold M. Rohr
Geo. W. Ross

First Lieutenants—Contd.

Foster M. Routh
Don J. Royer
Ernest Rupel
Warren D. Ruston
Ernest T. Saeger
Raymond A. Sands
Frank J. Sauer
David J. Saunders
Henry R. Scates
Charles Schabinger
Edward A. Schilz
Herman I. Schlegel
E. B. Schmeider
Ellis M. Schwartz
August C. Schwenk
A. L. Scibetta
Francis B. Sewall
N. J. Seybold
Harry L. Shaffer
William H. Sharp
Daniel E. Shea
Warren B. Shepard
Mandell Shimberg
Amos R. Shirley
Harry Silver
Hugh L. Simmons
William A. Singleton
John A. Sipher
D. M. Skinner
S. C. Slaughter
Walter S. Slicer
L. H. Smith
Norman M. Smith
Theron Smith
William E. Smith
William T. Smith
G. H. Snyder
Herman M. Sondel
Stephen J. Spitzes
J. C. Starks
Roscoe E. Stepfield
Edgar J. Stein
Henry C. Steinman
O. C. Stephens
Edwin F. Stewart
Morris E. Streen
William W. Street

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Daniel S. Strong
Roy R. Lessing Sturges
Albert S. Sukman
Charles G. Swan
Raymond E. Swope
Longin Tabenski
George J. Taquino
Jean E. Tellier
John D. Tidaback
Charles R. Thomas
Harry R. Thornton
J. W. Turner
Wm. P. Turner
John B. Tyrrell
Charles Usher
Edwin F. Vetter
Herbert A. Vogel
Samuel N. Vose
Roy E. Waggoner
Martin L. Wagner
Leroy McC. Walker
George H. Walter
Roy J. Ward
Raymond E. Watkins
David Weingarden
Paul G. Weisman
William T. Welch
Edwin M. Wheeler
Edward L. Whistler
Byron E. White
Harold E. White
Howard E. Whitney
Leroy D. Whitney
John B. Wickensinner
Bernard P. Widmann
Charles F. Wilcox, Jr.
Salmon P. Wilde
Robert B. Wilkins
Harry D. Williams
Horace J. Williams
George L. Wilson
Thomas B. Wilson
Philip L. Wise
Frederick Waltmann
John D. Wonder
John F. Wright
Oscar R. Yates

First Lieutenants—Contd.
B. W. Yawn
George I. Yearick
Charles O. Yenerick

Medical Corps, U. S. Navy
Lieutenants
Henry S. Brown
Felix P. Keaney
McClure Scott

Medical Corps, U. S. N. R. F.
Lieutenants
James F. Gorman
John C. Graham
Lincoln Humphreys
J. A. Mulholland
Thomas F. O'Brien

Medical Corps, U. S. Army
Majors
LeRoy Long
James M. Mason

Medical Corps, U. S. Army
Captains
Albert G. Anhauer
John I. Barron
Emile Brunor
Henry J. Burrell
Arthur R. Choppin
Lester F. Cleland
Meek M. Copenhaver
Thad Cothern
Edwin B. Daugherty
E. D. Ebright
Harvey K. Fleckenstein
Franklin P. Gengenbach
Laurence Graham
Oscar E. Grant
Lynne B. Greene
Edwin W. Holladay
Francis E. Hufnail
John M. Jones
William E. Mitchell
D. A. Myers

Captains—Continued
George D. Nicholas, Jr.
Charles I. Page
Carleton Potter
McLain Rogers
Ernest M. Roseberry
Thomas N. Seay
Ernest M. Seydell
Harry A. Shafor
Gail P. Shepard
Branwell F. Stevens
Charles G. Stivers
Randall S. Tilles
James P. Trotter
Ruliff L. Truitt
James W. Walters

Medical Corps, U. S. Army
First Lieutenants
Geo. W. Abersold
Wilson P. Allen
Robert L. Anderson
Paul Appleton
William N. Armstrong
C. Burke Bailey
Geo. F. Barnett
Julius Bondy
Ralph A. Bowdle
Harold W. Brann
Frederick N. Bunnell
Ludwig L. Cohan
Geo. W. Conrad
Benjamin Davis
Frank L. Davis
Guy S. Dunbar
Neil K. Forhan
Anthony C. Freeman
Elmo D. French
Charles F. Goetzinger
Max Goldberg
Frank W. Hannum
Jacob Heller
Harry E. Hoke
Charles S. Houtz
John C. Hughes
Geo. H. Kennett
Edwin P. Kitchin

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First Lieutenants—Contd.
John F. Larkin
James S. Logan
John A. Logan
Horace P. Mahan
Homer R. Mather
Noah M. McFarland
Edwin L. Miller
Enos D. Miller
William V. Mullin
Arthur V. Murtha
Carl C. Nohe
James F. Nolan

First Lieutenants—Contd.
Frank J. Norton
Robert W. Nosker
Flavius O. Plunkett
Hugo Reim
Elbert D. Rice
Eugene D. Rosewater
David H. Smith
Edwin W. Smith
Henry L. Sloan
Arthur J. Sullivan
Eugene M. Thompson
Julian A. Ward

First Lieutenants—Contd.
Burton A. Washburn
Earl W. Wilkins

Medical Corps, U. S. Navy
Lieut. Burchard A. Winne, U. S. P. H. S.
Act. Asst. Surg. Elmer D. Twyman

Associate Member
Dr. Claude J. Allen, Formerly Lieut. M. R. C., U. S. A.

[PUBLIC—No. 39.]

An Act To Incorporate the Association of Military Surgeons of the United States.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress Assembled, That George M. Sternberg, of the District of Columbia; Presley Marion Rixey, of the District of Columbia; Walter Wyman, of the District of Columbia; Nicholas Senn, of Illinois; Jefferson Davis Griffith, of Missouri; John Van Rensselaer Hoff, of New York; Robert A. Blood, of Massachusetts; Leonard B. Almy, of Connecticut; Nelson H. Henry, of New York; J. Francis Calef, of Connecticut; George Henderson, of the District of Columbia; Charles F. W. Myers, of New Jersey; John V. Shoemaker, of Pennsylvania; Angelo Festorazzi, of Alabama; Edmund C. Brush, of Ohio; Frederick W. Byers, of Wisconsin; James T. Priestley, of Iowa; James Evelyn Pilcher, of Pennsylvania; Marshall O. Terry, of New York; Winslow Anderson, of California; Charles H. Alden, of Pennsylvania; William W. Grant, of Colorado; Robert Harvey Reed, of Wyoming; Thomas C. Clark, of Minnesota; Robert A. Marmion, of the District of Columbia; Myles Standish, of Massachusetts; John C. Wise, of Maryland; George T. Vaughan, of Virginia; Albert H. Briggs, of New York; William C. Borden, of New York; Otis H. Marion, of Massachusetts, and their associates and successors, are hereby created a body corporate and politic in the District of Columbia, by the name of The Association of Military Surgeons of the United States, for the purpose of advancing the knowledge of military surgery, medicine, and sanitation in the medical departments of the Army, the Navy,

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and the Marine Hospital Service of the United States and of the militia of the different States, and to increase the efficiency of the different services by mutual association and the consideration of matters pertaining to the medico-military service of the United States in peace and in war.

SEC. 2. That the Secretary of the Treasury, the Secretary of War, the Secretary of the Navy, the Surgeon General of the Army, the Surgeon General of the Navy, and the Surgeon General of the Marine Hospital Service shall be made ex-officio members of The Association of Military Surgeons of the United States, and, with the president of the association, shall act as an advisory board to the said association.

SEC. 3. That said Association is authorized to hold real and personal estate in the United States, so far only as may be necessary to its lawful ends, to an amount not exceeding one hundred thousand dollars, and may adopt a constitution and make by-laws not inconsistent with law, and may adopt a seal and an insignia which may be worn by its members.

Approved, January 30, 1903.

CONSTITUTION AND BY-LAWS OF THE ASSOCIATION OF MILITARY SURGEONS OF THE UNITED STATES[1]

PREAMBLE

The Medical Officers of the Army, of the Navy, of the Public Health Service of the United States, and of the Organized Militia of the Different States, under the provisions of an act of Congress approved January 30, 1903, *have associated themselves together under the name of "The Association of Military Surgeons of the United States." Now, therefore, pursuant to the laws of the United States, the members of said Association do hereby ordain and enact the following:*

CONSTITUTION

ARTICLE I

NAME

The Association shall be known as "The Association of Military Surgeons of the United States."

[1] Adopted September 26, 1911.

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ARTICLE II

OBJECT

The object of the Association shall be to increase the efficiency of the medical service of the Army, the Navy, the Public Health Service, and of the Organized Militia of the different States by mutual association and the consideration of matters pertaining to the medico-military service of the United States both in peace and in war.

ARTICLE III

MEMBERS

Classification of Membership

SECTION 1. There shall be Active, Life, Associate, Ex-Officio, and Honorary Members.

Members Eligible to Office and Entitled to Vote

Sec. 2. Active and Life members only are eligible to office or entitled to vote.

Active Members

Sec. 3. Active membership is limited to commissioned medical officers of:

(1) The United States Army;
(2) The United States Navy;
(3) The United States Public Health Service;
(4) The Organized Militia of the several States;
(5) The United States Volunteers.

Active members may retain their membership, should they be honorably discharged from the service in which they have been commissioned, and nothing in this Article shall affect the membership rights of Contract or Acting Assistant Surgeons of the United States Army, Navy, or Public Health Service who were duly elected prior to the adoption of this Constitution.

Life Members

Sec. 4. Life membership and exemption from payment of annual dues is conferred upon—

1. Members who obtain first honorable mention in the prize competitions of the Association.

2. Any active member upon the payment of fifty dollars at one time.

3. Ex-presidents of the Association.

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Associate Members

Sec. 5. Associate membership is open to—

1. Ex-medical officers and
2. Other officers of the aforementioned services;
3. Ex-medical officers of the Confederate Army and Navy;
4. Medical officers of foreign service; and
5. Acting Assistant Surgeons (Contract Surgeons) of the U. S. Army, Navy and Public Health Service.

Ex-Officio Members

Sec. 6. The Secretary of the Treasury, the Secretary of War, the Secretary of the Navy, the Surgeon General of the Army, the Surgeon General of the Navy, the Surgeon General of the Public Health Service, in conformity with the Act under which this Constitution is adopted, shall be ex-officio members of the Association.

Honorary Members

Sec. 7. The President of the United States, the senior General officer of the Army, and the senior flag officer of the Navy for the time being, shall be honorary members. Other persons who have rendered distinguished service to the Association, or who have otherwise attained distinction deserving of recognition by the Association, are eligible to honorary membership.

ARTICLE IV

GOVERNMENT OF THE ASSOCIATION

Advisory Board

Section 1. There shall be an Advisory Board consisting of the Secretary of the Treasury, the Secretary of War, the Secretary of the Navy, the Surgeon General of the Army, the Surgeon General of the Navy, the Surgeon General of the Public Health Service and the President of the Association.

Officers

Sec. 2. The officers shall be a President and three Vice-Presidents, who shall be elected from and represent in regular rotation the Army, the Navy, the Public Health Service, and the Organized Militia; a Secretary and a Treasurer; all of which officers shall hold their respective offices until their successors are elected and qualified.

Executive Council

Sec. 3. There shall be an Executive Council, to consist of the

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officers and six (6) members, who shall be appointed by the President each year.

Committees

Sec. 4. There shall be the following committees, to be appointed annually by the President, except as hereinafter specified.

A Literary Committee, to consist of seven (7) members.

A Publication Committee, to consist of four (4) members, one of whom shall be the Secretary as ex-officio chairman.

A Necrology Committee, to consist of four (4) members.

A Committee of Arrangements for the next ensuing meeting, to consist of one (1) member, who shall be the chairman, with power to associate with himself such other persons, members of the Association or not, as he may see fit.

A Nominating Committee, based upon a representative or one vote for each State, Territory, the Army, the Navy, and the Public Health Service, and for every additional ten (10) members or major fraction thereof an extra representative or vote; said vote or votes to be cast by a member or members, present from each State, Territory, Army, Navy, and Public Health Service, to be designated by the members present from each State, Territory, Army, Navy and Public Health Service at the time of meeting.

A Committee on Legislation to consist of five members, one each from the Army, Navy and Public Health Service, and two members from the Organized Militia, to be nominated by the President and elected by the Association in annual meeting. (Adopted, Annual Meeting, Sept. 13-15, 1915.)

A Sinking Fund Committee to consist of the President, who shall be Chairman, the Treasurer, who shall act as secretary and custodian of the fund, and three members to be elected from the former Presidents of the Association, the latter to hold office for three years. Those first elected shall select by lot who shall go out at the end of the first, second and third year respectively, and each year thereafter one member shall be elected to the Committee at the annual meeting of the Association. Vacancies occurring in the interval may be temporarily filled by the Committee.

Boards of Award

Sec. 5. Boards of Award shall be appointed by the President for the consideration of such prize competitions as may from time to time be instituted by the Association. Membership in the Asso-

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ciation shall not be required of members of the Boards of Award, which shall be selected in each instance from men conspicuous for knowledge of the subject of the competition.

Article V

Seals, Insignia and Arms

Seal

Section 1. The seal of the Association shall consist of a circle, one and three-eighths (1⅜) inches in diameter, charged with the cross of the insignia with the words, "Organized 1891, Incorporated by Congress 1903," within a circumferential band bearing the words, "Association of Military Surgeons, United States."

Insignia

Sec. 2. The insignia of the Association shall comprise (1) a Cross; (2) a Ribbon.

(1) The Cross shall be of gold, the obverse enameled with red and bordered with gold, upon which shall be superimposed a white shield, inclosing a shield of the United States in its proper colors—red, white and blue with stars of gold—surrounded by the motto, "Omnia pro Patriæ Caritate;" the reverse, plain gold and bearing its number. Upon the reverse may also be engraved the name and address of the owner. The cross, suspended by a ribbon, consisting of two bands of crimson inclosing a band of white, may be worn by any member of the Association on ceremonial occasions, and shall be carried on the left breast—or at the collar, if the wearer be an officer of the Association.

The Ribbon

(2) The ribbon to be worn with civilian dress shall consist of a piece of ribbon 3/16 of an inch wide of the official colors of the Association, to be tied in the upper left hand button hole of the civilian coat and around the lapel with the knot to the rear.

The Coat of Arms

Sec. 3. The Coat of Arms shall be as follows: Quarterly. First: Sanguine, a caduceus or; for Army. Second: Or, an oak leaf and acorn proper; for Navy. Third: Argent, a caduceus and an anchor in saltier azure; for Public Health Service. Fourth: Azure and argent, the Union as borne on the American Flag; for the Organized Militia.

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Surcharge.—The Badge of the Association, proper.

Crest.—An Eagle displayed, proper, bearing on breast a Geneva Cross.

Article VI

QUORUM

Thirty-five (35) members shall constitute a quorum for the transaction of business, but a less number may adjourn.

Article VII

AMENDMENTS

All amendments to this Constitution shall be proposed in writing at one annual meeting and voted on at the next. A three-fourths vote of all the members present at the annual meeting shall be necessary for adoption.

Article VIII

SINKING FUND

Such funds belonging to the Association as are not needed in current requirements shall be placed in the hands of a Committee to be known as the Sinking Fund Committee. The Sinking Fund shall be invested in Government or other bonds approved by the Committee, or deposited in an approved Trust Company until so invested and no money shall be withdrawn from this fund except upon a majority vote of the Sinking Fund Committee and of the Executive Council voting separately in session or by letter. When withdrawal is thus approved, it shall be made by an order on the Treasurer signed by the President of the Association. The custodian (Treasurer) of the fund shall be bonded in such sum as the Committee shall determine, and his accounts, and the securities and funds shall be audited annually and at such other times as the Committee requires.

BY-LAWS

Article I

ELECTION TO MEMBERSHIP

Active or Associate Membership

Section 1. Election to active or associate membership shall be by the Executive Council, to whom the Secretary shall refer all applications, together with such credentials as may be presented.

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Honorary Membership

Sec. 2. Election to honorary membership shall be by a two-thirds vote of the Association, after the unanimous recommendation of the Executive Council.

ARTICLE II

Expulsion from Membership

Any member who may be dismissed from the service for conduct unbecoming an officer and a gentleman, or who may be guilty of such conduct though then not a member of the service, shall be expelled and debarred from any further rights or privileges when proper proof has been furnished.

ARTICLE III

Meetings

The Association shall meet annually, the time and place to be fixed at each meeting for the one ensuing. Special meetings may be called by the President at any time. At the annual meeting the President, Vice-Presidents and Treasurer shall be elected for the term of one year, the Executive Council and standing committees appointed, and the annual reports received.

ARTICLE IV

DUES AND FEES

Admission Fee

SECTION 1. The admission fee to be paid by active and associate members shall be five dollars ($5.00), which shall accompany the application for membership. This shall include subscription to THE MILITARY SURGEON for one year.

Annual Dues

Sec. 2. The annual dues shall be one dollar ($1.00), due on the first of January of each year. No annual dues shall be required of new members for the remaining portion of the calendar year in which their admission fees have been paid. Delinquency for two years shall terminate membership, after due notice by the Treasurer. Provided that in the case of members who have resigned or have been dropped for non-payment of dues under Section 2 of this article, such members may be readmitted without payment of a second entrance fee and upon payment of delinquent dues.

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Members Exempt from Dues

Sec. 3. Honorary, Ex-Officio, and Life Members shall be exempt from the payment of dues.

Official Journal

Sec. 4. The annual subscription to the official journal by members of the Association shall be three dollars ($3.00), payable in advance and the journal shall be stopped on expiration of unrenewed subscription.

ARTICLE V

DUTIES OF THE ADVISORY BOARD

The Advisory Board shall meet at such times as the interests of the public service may demand. Meetings may be called by one or more members of the Board and three members shall constitute a quorum. Any action taken by the Board shall be reported to the Association through the President of the Association.

ARTICLE VI

DUTIES OF OFFICERS

The President

SECTION 1. The President shall preside at all meetings, appoint all committees, unless otherwise provided for, approve all proper bills, and perform such other duties as are usually incumbent upon such an officer.

The Vice-Presidents

Sec. 2. The Vice-Presidents in order of seniority shall perform the duties of President in the absence or inability of that officer.

The Secretary

Sec. 3. The Secretary shall keep the minutes of the meetings, the records and archives of the Association; receive all applications for membership and refer them to the Executive Council; notify the Treasurer of the election of active and associate members; issue certificates of membership to active, associate, and honorary members on election, and to life members when advised by the Treasurer that the necessary fee has been paid; and shall hold office until his tenure is terminated by resignation or death, or by the elction of his successor after due and timely notice.

He shall be a member and ex-officio chairman of the Publication Committee.

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He shall appoint an Assistant Secretary each year, and shall present an annual report.

He shall be editor of the official journal.

The Treasurer

Sec. 4. The Treasurer shall receive all moneys due the Association, collect all assessments, and pay all bills which have been properly approved, except as provided in Article X.

The accounts of the Treasurer shall be audited by a committee appointed for that purpose on or before the annual meeting, and at such other times as the Executive Council shall require. He shall present an annual report in which he shall state the number of members for each Service in the following classes: Life members; Active members in good standing; Active members delinquent; resigned; died, and dropped under Article IV, Sec. 2, of the By-Laws. Said report shall show all receipts, disbursements and outstanding debts of the Association.

Member in good standing shall be those who have paid all their annual dues at date of the last audit of the Treasurer's account and none other shall be allowed to vote or be counted for votes in the annual or special meetings except by authority of the Executive Council, in each case where dues have been paid after that date. Adopted, 1915 Annual Meeting.

He shall be custodian of the Sinking Fund.

He shall execute such bond as may be approved by the Executive Council for the faithful performance of his duties, the Association to bear the cost of this insurance.

ARTICLE VII

THE EXECUTIVE COUNCIL

Duties

SECTION 1. The Executive Council shall be charged with the conduct of the affairs of the Association during the intervals between the annual meetings, shall elect active and associate members, and perform such other duties as may be assigned to it by the Constitution and By-laws or by vote of the Association at any stated or special meeting. It shall temporarily fill all vacancies occurring among the officers of the Association between annual meetings.

Conduct of Business

SEC. 2. The business of the Executive Council may be conducted

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by correspondence or at such meetings as may be called by the chairman upon his own initiative or at the request of any three members. The Secretary shall keep a record of such correspondence and of the minutes of the meetings of the Council.

Officers

SEC. 3. The President and the Secretary of the Association, respectively, shall be ex-officio chairman and secretary of the Executive Council.

Quorum

SEC. 4. Five members of the Executive Council in meeting shall constitute a quorum for the transaction of business. In correspondence a majority of the whole Council shall govern.

ARTICLE VIII

DUTIES OF COMMITTEES

SECTION 1. The Literary Committee shall outline the literary work for the annual meeting in advance, making the necessary arrangements for the reading and discussion of papers.

The Chairman shall be responsible for the program for the ensuing meeting.

The Committee shall assist the Publication Committee in the prompt publication of the Proceedings.

The Publication Committee

SEC. 2. The Publication Committee shall have charge of the publications of the Association.

It shall determine what portions of the proceedings are of sufficient general interest to be printed and decide upon the advisability of publishing the several papers presented at the annual meetings, and such other matter as may be of value to the Association.

The Necrology Committee

SEC. 3. The Necrology Committee shall report to the Association, at each annual meeting, the deaths that have occurred during the preceding year among the members of the Association, with a suitable memoir in each case.

The Committee of Arrangements

SEC. 4. The Committee of Arrangements shall have charge of all local arrangements for the annual meetings of the Association.

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The Nominating Committee

SEC. 5. The Nominating Committee shall, at the annual meeting, present a list of candidates for the various offices for the ensuing year.

The vote or votes of the Nominating Committee shall be cast by a member or members present from each State or Territory, the Army, the Navy, and the Public Health Service.

ARTICLE IX

DUTIES OF BOARDS OF AWARD

Boards of Award shall be charged with the selection of the person or persons to whom prizes shall be awarded, in accordance with the regulations of such prize competitions as may, from time to time, be instituted, and shall report the results thereof at such time as may be designated by the Association.

ARTICLE X

THE JOURNAL OF THE ASSOCIATION

The Association shall publish a monthly journal to be known as THE MILITARY SURGEON, in which shall be printed the proceedings of the annual meeting and such other matter as is determined upon by proper authorities. The cost of the journal shall be paid by an allotment of Association funds to be made on a budget submitted by the Editor and approved by the Executive Council.

The Secretary shall be ex-officio Editor of the journal and may appoint, with the approval of the Executive Council, such associate Editors and Collaborators as he finds necessary or desirable in conducting its publication.

He shall receive such monies accruing from subscribers, advertisers, and other sources pertaining to the journal as are sent to him, shall keep a business record of the same and deposit the money in a bank approved by the Executive Council, in the name of The Association of Military Surgeons of the United States, subject to his order.

He shall pay such bills as are due in connection with the journal, which have been approved by the President, or an officer of the Association designated by him, and shall render a monthly account through the President to the Treasurer with his check for any unexpended balance remaining to his account at the end of each month.

The Editor shall be bonded in amount determined by the Execu-

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tive Council and shall submit a report at the annual meeting of the Association, with a statement of his account duly audited by a certified accountant, to be designated by the Executive Council, and such other reports as may be called for by the Council.

Article XI

Amendments

All proposed amendments to these by-laws must be forwarded to the Secretary, who will present them to the Executive Council at least three months before the next annual meeting. The proposed amendments and views of the Council shall be published in the journal of the Association not later than one month before the annual meeting, at which meeting they may be adopted by a three-fourths vote of all the members present.

Article XII

Order of Business

1. Reading of records of previous meeting.
2. Appointment of Committees.
3. Report of Executive Council.
4. Report of Secretary.
5. Report of Treasurer.
6. Report of Editor.
7. Report of Standing Committees.
8. Report of Special Committees.
9. Unfinished Business.
10. New Business.
11. Literary and Social Program.
12. Election of Officers.
13. Installation of New Officers.
14. Reports of Committees.
15. Incidental Business.
16. Adjournment.

The parliamentary rules governing in the Congress of the United States shall be the standard of this Association.

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Obituary

Those of our membership whose deaths have been noted since our last report are as follows:

Major Howard Walter Beal, M. R. C., U. S. A.
Died July 20, 1918, in France.

Captain Paul Eugene Betowski, M. R. C., U. S. A.
Died July 2, 1918, in France.

Lieutenant George Jackson Brand, M. R. C., U. S. A.
Died February 11, 1918, at Camp Doniphan, Okla.

Captain J. G. Ellis, Jr., M. R. C., U. S. A.
Died July 2, 1918, in France.

Lieutenant George Plummer Howe, M. R. C., U. S. A.
Died while on duty with A. E. F., September 28, 1918.

Captain John Weaver Luther, M. R. C., U. S. A.
Died at sea, December 28, 1917.

Lieutenant William Joline Martin, M. R. C., U. S. A.
Died July 21, 1918, at Liverpool, England.

Lieutenant Sidney Lehman Spiegelberg, M. R. C., U. S. A.
Died July 14, 1918, in France.

Lieutenant Nehemiah Fay Tilton, M. R. C., U. S. A.
Died August 22, 1917, at Marion, Ohio.

Lieutenant Colonel Frank Chisholm Todd, M. R. C., U. S. A.
Died July 4, 1918, at Chicago.

Lieutenant George Hamilton Trevelyan, M. R. C., U. S. A.
Died January 31, 1918, at Fort Leavenworth, Kans.

Lieutenant Guy Austin Tull, M. R. C., U. S. A.
Died July 13, 1918, at Kansas City, Mo.

Major Walter Whitney, M. R. C., U. S. A.
Died September 4, 1918, at Augusta Arsenal, Ga.

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